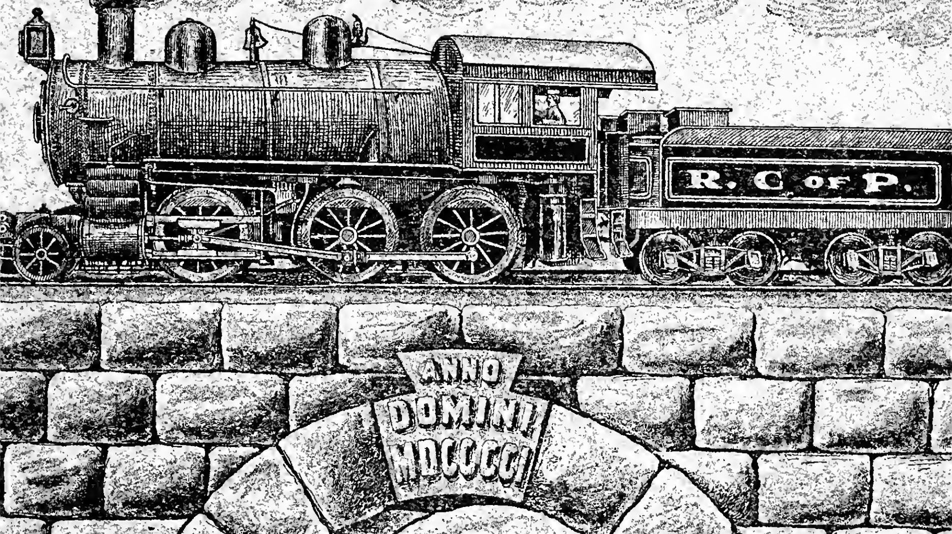
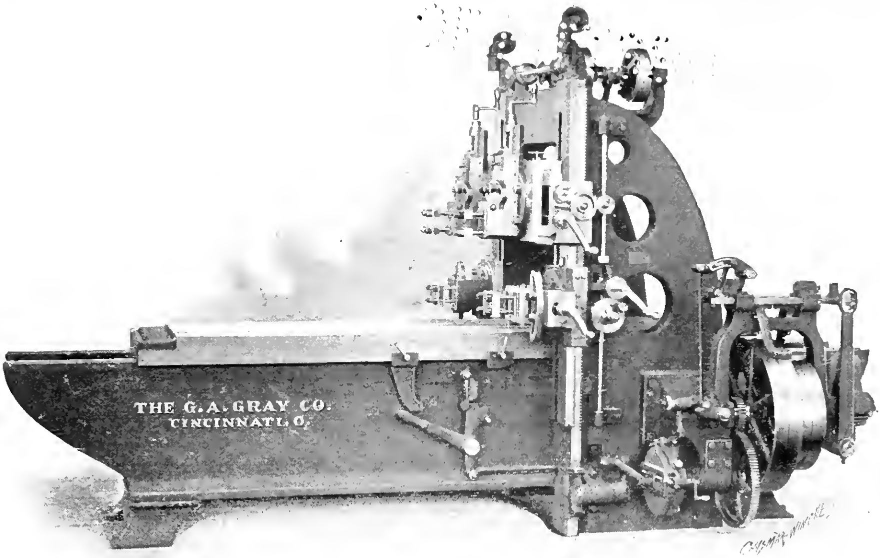
RAILWAY CLUB OF PITTSBURGH.

OFFICIAL PROCEEDINGS.



PITTSBURGH,
PENNSYLVANIA.

NOVEMBER 1901.


THE G.A. GRAY CO.
CINCINNATI, O.

Classified Index of Advertisements

ORGANIZATION AND OFFICIAL PROCEEDINGS

of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

OFFICERS, 1901 - 1902.

President,
J. H. McCONNELL,
Manager American Locomotive Co., Pittsburgh, Pa.

Vice-President,
L. H. TURNER,
Supt. Motive Power, P. & L. E. R. R.
Pittsburgh, Pa.

Treasurer,
J. D. McILWAIN,
Sales Agent, J. D. McIlwain & Co.,
Pittsburgh, Pa.

Secretary,
J. D. Conway,
Chief Clerk, Supt. M. P., General Offices P. & L. E. R. R., Pittsburgh, Pa.

Executive Committee,

D. F. CRAWFORD,
Supt M. P. Penna. Lines West of Pgh.,
Ft Wayne, Ind.

J. E. SIMONS,
S. of R. S. & M., Pittsburgh Coal Co.,
Pittsburgh, Pa.

F. T. HYNDMAN,
S. M. P., Bflo., Roch. & Pgh. R. R. Co.,
Du Bois, Pa.

VOL. I.
NO. 1.

Pittsburgh, Pa., November 15, 1901.

$1.00 Per Year
20c. per Copy.

Published monthly, except June, July and August, by the Railway Club of Pittsburgh,
J. D. Conway, Secretary, General Offices P. & L. E. R. R., Pittsburgh, Pa.

Meetings held fourth Friday each month, except June, July and August.

ORGANIZATION.

A call was issued on October 2, 1901, for the purpose of organizing a Railway Club at Pittsburgh, Pa., meeting to be held in the parlors of the Hotel Lincoln, at 2:00 o'clock P. M., October 18, 1901, signed by the following gentlemen:

J. H. McConnell, Manager American Locomotive Co., Pittsburgh, Pa.

D. F. Crawford, Superintendent Motive Power Pennsylvania Company, Ft. Wayne, Ind.

L. H. Turner, Superintendent Motive Power Pittsburgh & Lake Erie Railroad, Pittsburgh, Pa.

J. D. McIlwain, Sales Agent, Pittsburgh, Pa.

Pursuant to this call, there being a representative gathering present, Mr. J. D. McIlwain called the meeting to order and asked for the nomination of a temporary chairman; upon motion of Mr. L. H. Turner, Mr. J. H. McConnell was unanimously elected and called to the chair. In the acceptance of this recognition the chairman paid a very eloquent and glowing tribute to the City of Industries. He then asked for the nomination of a temporary secretary, and upon motion of Mr. J. E. Simons, Mr. J. D. Conway was unanimously elected. A permanent organization was then effected by the election of the following officers:

J. H. McCONNELL, President.
L. H. TURNER, Vice President.
J. D. CONWAY, Secretary.
J. D. McILWAIN, Treasurer.
D. F. CRAWFORD, J. E. SIMONS, F. T. HYNDMAN, Executive Committee.

The following gentlemen were then named to draw up the Constitution and By-Laws for the government of the club, to be presented at the next meeting: J. D. Conway, H. W. Watts and J. H. McConnell. After several names were suggested it was upon motion unanimously agreed to name it the "Railway Club of Pittsburgh."

The president declared a recess to give those present an opportunity to enroll their names. During the recess forty-nine names were enrolled.

The President called the meeting to order, and it was then decided to hold the next meeting at 2:00 o'clock P. M. Friday, November 15, 1901, at the Hotel Lincoln, Pittsburgh, Pa. The initiation fee was fixed at two dollars, and the Secretary instructed to accept all those wishing to become charter members, until the next stated meeting; then, upon motion, the club adjourned.

PROCEEDINGS OF MEETING OF NOVEMBER 15, 1901.

The meeting was called to order at 2:00 o'clock P. M., at the Hotel Lincoln, with President J. H. McConnell in the chair.

The following gentlemen registered:

Anderson, Thos.,	Mooney, E. P.,
Bole, Robert A.,	McConnell, J. H.,
Booth, J. B.,	McFeatters, F. R.,
Brown, John T.,	McIlwain, J. D.,

J. H. McCONNELL, President.

Brown, F. Herbert,	Noble, D. C.,
Campbell, A.,	Postlethwaite, C. E.,
Conway, J. D.,	Sherman, C. W.,
Diamond, P. R.,	Simons, Jas. E.,
Gies, Geo. E.,	Stowell, Myron R.,
Hogan, Sylvester,	Stucki, A.,
Hukill, J. L.,	Sweeley, G. P.,
Hyndman, F. T.,	Terry, W. A.,
Jones, D. P.,	Turner, L. H.,
Kerr, Edward,	Watts, H. W.,
Lane, Francis W.,	Wray, Robert,
Mason, Stephen C.,	Wright, R. V.,
Miller, Marion M.,	Yohe, J. B.
Miner, W. H.,	

President:—Gentlemen, please come to order. We will now proceed with the regular order of business. The first in order will be the reading of the minutes by the Secretary.

Secretary reads the minutes of the meeting of October 18, 1901.

President:—There being no objections or corrections, the minutes stand approved as read.

Secretary reads the list of charter members. (See Page 17.)

President:—I would like to ask if the Executive Committee has any report to make.

Mr. Simons:—I received a message from Mr. Crawford, Chairman of this committee, advising that he would not be able to be here to-day, but I will say that so far as the Executive Committee is concerned, we have taken no steps toward procuring a permanent place of meeting, for the reason that we want to determine, if possible, the size of the room that we will require, and will say further that the proprietor of this hotel is perfectly agreeable to have us meet in this room. I would suggest that unless the club decides otherwise, we hold the next two meetings here, or until such time as we will know what we will require.

President:—I believe it is the pleasure of the members that the meetings be held here, and the matter is entirely in the hands of the Executive Committee; whatever they do in the matter will be satisfactory to the members of the club.

President:—Mr. Secretary, have you report from the committee on Constitution and By-Laws?

Secretary:—The Committee on Constitution and By-Laws prepared and have ready for the consideration of the members Constitution and By-Laws for the government of this club, which it is hoped will meet their approval.

President:—I would suggest that they be read and taken up seriatim.

Secretary reads Constitution and By-Laws. They were then taken up seriatim and adopted as read. (See Page 13.)

President:—The next in order is communications, notices, etc.

Secretary:—The following communication has been received from the Central Railway Club, of Buffalo, dated November 14, 1901:

"Mr. J. D. Conway,
Secretary The Railway Club of Pittsburgh,
Pittsburgh, Pa.

Dear Sir—The Central Railway Club at its last meeting adopted a resolution extending greetings to your organization with best wishes for its prosperity and extended influence.

Very truly yours,
HARRY D. VOUGHT,
Secretary."

President:—The next in order is unfinished business.

Secretary:—No unfinished business.

President:—The next in order is new business.

Secretary:—No new business.

President:—The next in order is recess. Shall we continue and finish up the business on hand? Moved and seconded that recess be dispensed with and we have a continuous session. Motion carried.

President:—The next in order is discussion of subjects presented at previous meeting. As we had no subjects for discussion at the last meeting, it is understood that Col. Jones, late of the United States Navy, who is present to-day, has consented to deliver a short address.

Some of the Underlying Causes for the total Destruction of the Spanish Fleet at Santiago.

BY COL. DAVID P. JONES.

When on that fateful July day of Eighteen Hundred and Ninety-eight, the news was flashed through our country and to the whole world, that the Spanish Fleet had been annihilated, our people became delirious with joy, while all Europe stood aghast at the completeness of the destruction of such a fleet of first-class modern war vessels, and when it was realized that such a destruction was accomplished with comparatively little injury to the attacking squadron, the wonder increased.

L. H. TURNER, Vice-President.

Then followed the discussion of the causes for so complete a victory and so clean a wiping out of vessels supposed to be invulnerable to the ordinary modes of marine warfare.

While there has been much discussion of this subject by naval experts, little has been published and given to the world, showing reasons and conclusions.

The object of this brief discussion is to give what are believed to be the fundamental reasons for so complete a victory and so thorough a ruin of a fleet of modern first-class cruisers and battleships.

It must, of course, be admitted by every patriotic American, that the superiority of our captains and sailors was the prime factor in the achievement. The superior maneuvering, the deadly aim of the Yankee gunners, the racial ability and skill in fighting on the water, contributed much to the wonderful result; and yet, with all this, there must yet remain some reasons for the non-escape of any of the Spanish vessels.

In this discussion an epitome of some of the characteristics of American sailors, American ships and American methods of ocean warfare may not be inappropriate.

Much of our previous naval success has been due to the superior gunnery and skillful handling of ships. During the brief war with France, in the beginning of the last century, two of the finest vessels of that nation were reduced to wrecks in about thirty minutes' time for each. These were the ships "Insurgent" and the "Vengeance," that were destroyed by the American frigate Constellation, commanded by Captain Truxton. The result of these two battles awoke France to the realization that a new sea power had been born, and that nation soon decided that peace was better than warfare with such a power.

Then followed the War of 1812, with the wonderful achievements of our bold captains, and Britania also began to realize that one of her children would dispute with her the supremacy of the oceans.

The brief and emphatic message of Perry from Lake Erie, the dying words of Lawrence on the Chesapeake, forever fixed upon the log books of our navy the tradition that the honor of that branch of our military service should forever be upheld.

Coming to the War of the Rebellion, the tremendous victories of our immortal Farragut and his captains, the innumerable incidents of conspicuous personal courage, ability and heroism, further stimulated our sea captains and their subordinates, both officers and men, into the fixed conviction that to fight any enemy, meant to become victorious, and so it has

come to be a tradition in the navy that the hauling down of the flag is the very, very, last thing to be thought of, and is not to be thought of then.

A little incident, occurring during the time of the memorable conflicts following the raid of the famous and formidable Confederate ironclad, the "Merrimac," will probably convey much of the inherent feeling dwelling within the bosom of every man wearing the Navy Blue. At this time, old Commodore Joseph Smith was at the head of one of the Bureaus of the Navy Department. His son, Lieutenant Commander Joseph Smith, was the executive officer, or second in command, of the sailing frigate Congress.

It may be remembered that when the Merrimac first came out, she assailed the steam frigate Minnesota, after that she steamed up to Newport News, where the two sailing frigates, the Congress and Cumberland, were anchored. Now it happened that the commanding officers of both these vessels were not on board, so the ships were commanded by the executive officers, Lieut. Commander Smith on the Congress, and Lieut. Commander George Morris on the Cumberland.

These helpless vessels lay at anchor and the Merrimac steamed up and demanded their surrender. The reply was a broadside from each, the shots of which rolled from the iron sides of the Merrimac like pebbles. The Merrimac returned the fire and poured into them broadside after broadside, sinking both, and killing Executive Officer Smith. Just before the Congress sunk, her colors were struck. The Cumberland went down with colors flying.

When this tragic news was telegraphed to Washington, where it arrived at night, the then Secretary of Navy, Gideon Welles, went to see old Commodore Smith to break to him the tidings of his son's death. Mr. Welles, first mentioned the sinking of the Congress and the striking of her colors. The old Commodore, with choking voice and streaming eyes, said, "You say the Congress struck her colors? Then my Joe is dead." Yes, my friends, his Joe was dead. This little incident is given to illustrate the faith that officers have of their brother officers keeping the colors flying. It afterwards developed, that the halyards, or lines holding the Congress' colors, had been shot away.

Shortly after the close of the war Captain Morris, who commanded the Cumberland, was asked, why, in view of the great destruction of life on his ship, he hadn't hauled down his colors. "I never thought of such a thing as that," was his reply.

This feeling of confidence among our officers and men go

J. D. CONWAY, Secretary.

far towards insuring a victory. When chasing the enemy, no one on our ships speculate as to the result of the coming conflict. Their one prayer is to "catch up to the enemy and give it to them."

In these advanced times, too, the physical forces, the great, the powerful engines and boilers are, or were during the Spanish war, in charge of intelligent and trained engineers, men of skill and practical experience, men full of patriotic zeal to keep the complicated machinery under their charge, up to the top notch of efficiency.

In the above paragraph lies the germ of our immense superiority over the Spaniards. Personally, the Spanish officers and men, are as brave and chivalrous as any in the world. They willingly lay down their lives for their country's honor. True they often do this with picturesque and panoramic posing. "I go down with my ship," says Don Diego, and he does go down with her. Our sea bull dogs say, "I may go down with the ship, but I'll try and make the other fellow go down first." Much of the secret of success, lies in this matter of fact trait. It is the racial difference.

But even what has already been said, does not account for the fact that in the conflict under discussion, not one of the swift and powerful Spanish ships escaped destruction. A study of the subject, a knowledge of the ways and methods of the Spanish Naval Bureau shows, that officially, the Spaniards in control of the Navy regard all those in charge of the machinery of their vessels as out of the pale of the officers' guild. To them, the Naval Maquinistas, or Engineers, are men to be hired from other countries, to be placed in charge of the engines and boilers, who are paid good wages, but regarded as altogether a different race of beings from the hidalgos who carry a sword. And so they spend millions upon splendid vessels, then hire foreign engineers to look after their motive power, giving them good pay, but no official authority. Is it natural that such men should take a patriotic interest in their work? Is it natural that they should resort to every ingenious mechanical expedient to keep the machinery under their control up to the highest state of efficiency. To this very fact can be traced much of the failure of the Spaniards to save even one vessel.

When those great ships steamed out of Santiago, ships with machinery capable of driving most of them from 16 to 18 knots, they were overtaken and destroyed by our vessels of far lesser speed capabilities, and not one of them escaped.

To this add the great handicap of the Southern Latin race (the inability to successfully battle on the water), and

the cause of this notable defeat and destruction is apparent; and this destruction was a deserved lesson for any nation that has no use or regard for the physical and mechanical sciences, and that holds the exponents of these sciences in disdain, has no right-of-way in the march of modern progress and enlightenment has no right to be in touch, shoulder to shoulder, with a hustling, driving, healthy, and progressive republic like ours. Such a country is fitly governed by the hereditary descendants of those Bourbons, of whom it has become a truism and a by-word, "that they never forgot anything and never learned anything." A country contentedly governed by such blood, must partake of their ways and their instincts, and the decadence of the once mighty Spanish Empire has long ago testified to the world, that time brings its own revenge, and the inexorable march of fate will relegate to oblivion those of the earth who do not progress.

Is it a wonder then that a country, notwithstanding its brilliant, glittering, but cruel past, overshadowed by gloomy and horrible traditions, should meet its fate in the midst of those beautiful islands, once so thickly peopled with their peace-loving aboriginals, whose complete annihilation is one of the darkest spots in the history of Spain?

Is it possible that the awful atrocities of the Conquistadores, brought forth the shadowy spectres of the butchered thousands of the Antilles, arraying themselves against the descendants of their crude invaders. Quin sabe?

Taking what has been said in detail, the inability of the Spaniards to properly handle their vessels, their non-recognition of the vast importance of the mighty physical forces, under their charge, their contempt of the exponents of these forces, added to the manifest superiority of our own people, and we have causes enough to sink a thousand ships.

As a contrast to the probable action of Spain under similar circumstances, a little incident that occurred on the Oregon during the Santiago chase, will be interesting.

When the chase after the Spanish Fleet had continued for some little time, Commander Milligan, Chief Engineer of the Oregon, was down in the engine and fireroom. There were the firemen stripped to the waist, and firing their boilers with all the energy that was in them. Milligan saw that they had almost reached the point of exhaustion. With no battle noises or signs, to encourage them, he saw that human physical ability had reached its limit. And down in the depths of the ship with the intense heat and noxious gases of the roaring furnace and the hum of the engines in his ears, he realized what exhaustion at that time meant to his ship and his coun-

J. D. McILWAIN, Treasurer.

try. He went up on deck and reported to Captain Clark the condition of affairs. The captain said that the enemy were too distant to be reached by the guns, and he would send the Powder Division below to help get out the coal. Milligan suggested that in addition to that, if the captain would fire off his big rifles after the enemy, even if he couldn't reach them it would have an inspiring effect upon the men. Captain Clark thought the idea a good one, and said he would do it. Milligan at once went below, and at a glance he saw that the firemen could last but a little longer. With bodies streaming with perspiration, with panting breasts and haggard eyes, they were on the point of collapse.

At that moment the great forward rifle was fired. As the roar of explosion reached the fireroom, every man sprang to his feet. The effect of a live wire could not have been more electric, men who but a moment before were panting in extreme exhaustion sprang to their feet as though invigorated with new life. With one great cheer of joy, and a roar of "We have got them." "We have got them," they sprang with renewed vigor to their fires and pulled up the speed of that ship to what she had never done before. When the second gun was fired, they were simply delirious with joy. No time for feeling tired now. No time for exhaustion. No indeed, "They were in it." At this moment some of the Powder Division made their appearance to give help, but they were met with a great cry of "Out oi this. Go back and fight your guns, and don't let them Dagos get away." Such my friends is the spirit that animates our boys—our boys away deep in the bowels of the ship, with no hope of reward, but with patriotism bubbling at every pore. Is it a wonder then, that Spain bit the dust in bitter humiliation?

President:—Mr. Simons has kindly consented to give us a little talk this afternoon, and we will now hear from him.

Mr. Simons:—Mr. President, and Gentlemen: I desire to say that I am not as well gifted with speech as my predecessor, but have written a short article which refers to the relation of the young man to our club, which I shall be pleased to read to you if you will kindly bear with me.

Relation of the Young Man to our Club.

BY J. E. SIMONS, S. OF R. S. & M., PITTSBURGH COAL CO.

In all organized bodies of to-day, it is essential that what we consider young men, be given an opportunity to glean and distribute such knowledge as they may have gathered in their short careers. The question naturally arises, "Why is this?" In the opinion of the writer this is due to two causes:

First—The desire of the older and experienced men to see the young men develop, and, second—The energy and push of the young man in his efforts to find his proper station in the business world.

In analyzing the first of these causes we find, generally speaking, that when a man has reached the age of from forty-five to fifty years he has absorbed wisdom, from experience, and become settled to a very great extent in his ideas and opinions, and consequently his mind is not as receptive as that of the younger man. His judgment, however, is generally of greater value than that of the younger man, for the reason that during his lifetime he has had to contend with problems having a tendency to ripen and mature. For this reason he is better fitted for positions requiring executive ability, and, as a rule, we find the best positions, where the requirements of executive ability are above the average, generally filled by men whose training has been practical, combined in many instances with a good theoretical knowledge. However, in looking around us, we can find many instances of men below forty years of age who are filling high and important positions of trust, and evidence is fast accumulating that the age of maturity and good judgment is ten years in advance of what it was twenty years ago.

We should give credit where credit is due, and to the older men this credit belongs, for they have prepared the way, by the establishment of educational institutions and the compilation of experience, to make this condition possible.

Taking up the young man of to-day, we find him, as a rule, launched into the business world thoroughly equipped with an education in his particular line to enable him to push forward and exert what energy he has, to find his proper level. If his energy is properly applied we find him rapidly forging to the front, but, on the other hand, if he is not diligent, he will drop by the wayside and find that he is not without competitors.

He has the advantage of past generations, and also the older generations of to-day, who have compiled and put into condition for his reference the results of their many years of hard labor. He has been taught to reason problems, where to look

J. E. SIMONS, Member Executive Committee.

for information, and to obtain knowledge in ways that his forefathers have prepared by long and careful study. Why, then, may we ask, should he not be recognized by the organizations of to-day, and given every opportunity to broaden his mind and lay in a store of useful information for coming generations?

Passing from the general business world to his relation to an organization of this kind, we find him here awaiting the opportunity to make his presence and knowledge felt, and, as one, it will be a pleasure for me to assist him in every way possible,—to make this club one of the most successful of its kind in existence.

In the investigation necessary to prepare papers for the consideration of the club, his mind has been prepared to enable him to make proper research, and to put results obtained in form for consideration. He should have all the work of this nature that he can properly take care of, and we expect to hear from him in the debates of subjects under consideration. We will, no doubt, find him at times not in exact harmony with established ideas and customs, and we may differ in opinion with him, but the tendency should be to set him right, and encourage him to better efforts in the future.

While the organization is composed largely of men connected with railroads, and representatives of railroad supply manufacturers, a splendid field is open to it in this vicinity to obtain knowledge such as no other club of the kind can obtain.

Conditions surrounding the operations of railroads in Pittsburgh, and within a radius of 60 miles, are of a nature peculiar to themselves, and a great deal of information of advantage to our respective companies can be obtained which would be of everlasting benefit, not only to the railroads themselves, but to the community in general.

In collecting and distributing this information we shall expect the young man to perform his part, as by taking an active interest in this institution he will no doubt realize that he is not only doing the club an honor, but preparing the way for his recognition in associations of a national character.

To the various national associations a club of this kind can be of distinct value, and become an important feature in the element of railroading.

What I have said of the young man is also applicable to us as an organization. We have the foundation and experience gathered and compiled by other clubs from which we can obtain benefit, and derive methods and forms of procedure, which they have had to work out, and we may feel assured that the prospects of this club are so bright, that with proper energy displayed on our part we may rise to a high level in our relative position to other clubs.

This is the most earnest wish of the writer, and you will find him ever ready to lend assistance to accomplish the desired end.

Mr. Turner:—Mr. President, I feel we are very much indebted to Col. Jones for his entertaining and instructive address, and to Mr. Simons for his valuable paper, which seems to me very interesting, and coming at this time, should be an encouragement to all young men, whether members of this club or not. I therefore move a vote of thanks be tendered Col. Jones and Mr. Simons.

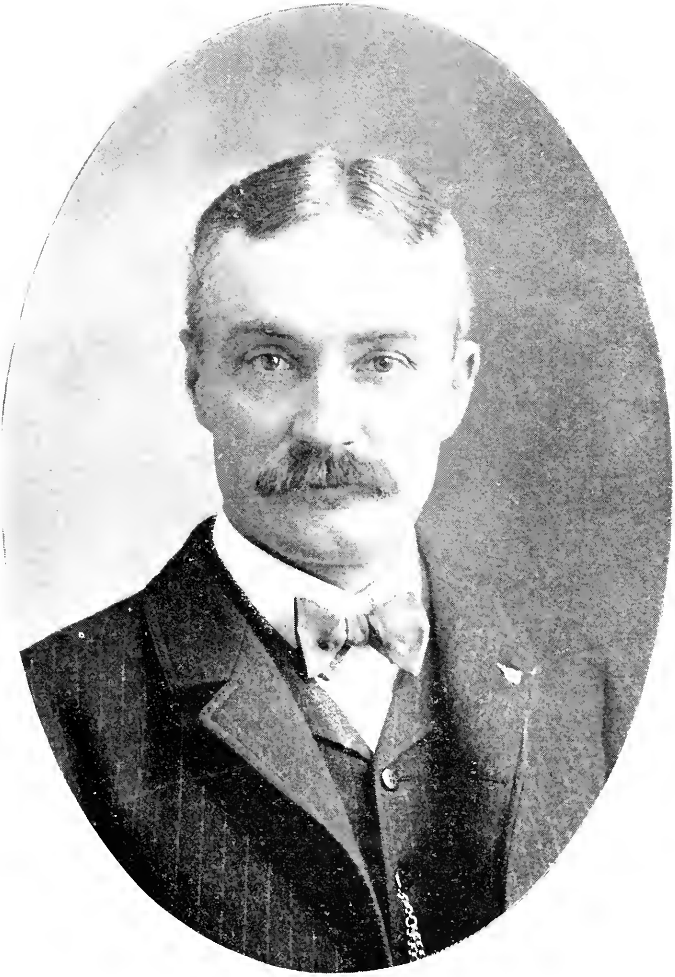
Motion carried.

President:—In this connection I wish to say that after the organization of this club the Executive Committee found it difficult to get together and arrange for a suitable paper for this occasion. Col. Jones a few days ago kindly consented, at my invitation, to give us an address. He did not tell me what his subject would be, but after talking the matter over with him, and telling him that we did not have a paper in any form, he readily consented to give us a short talk. Not being able to get any one to present a paper, owing to the limited time in which to do so, Mr. Simons, a member of the club, and one of the Executive Committee, kindly consented to make a few remarks to the club to-day, and I think both of these gentlemen are heartily entitled to the vote of thanks you have given.

Mr. Postlethwaite:—I think Col. Jones' address and Mr. Simons' article are both worthy of space in our journal.

President:—I think they will both be printed in the first number of our Club proceedings.

Adjournment.



F. T. HYNDMAN, Member Executive Committee.

RAILWAY CLUB OF PITTSBURGH.

CONSTITUTION.

ARTICLE I.

The name of this organization shall be "The Railway Club of Pittsburgh."

ARTICLE II.

OBJECTS.

The objects of this Club shall be mutual intercourse for the acquirement of knowledge, by reports and discussion, for the improvement of railway operat on, construction, maintenance and equipment, and to bring into closer relationship men employed in railway work and kindred interests.

ARTICLE III.

MEMBERSHIP.

Section 1. The membership of this Club shall consist of persons interested in any department of railway service or kindred interests, or persons recommended by the Executive Committee upon the payment of the annual dues for the current year.

Sec. 2. Persons may become honorary members of this Club by a unanimous vote of all members present at any of its regular meetings and shall be entitled to all the privileges of membership and not be subject to the payment of dues or assessments.

ARTICLE IV.

OFFICERS.

The officers of this Club shall consist of a President, Vice-President, Secretary, Treasurer, and three elective Executive members who shall serve a term of one year from the date of their election, unless a vacancy occurs, in which case a successor shall be elected to fill the unexpired term.

ARTICLE V.

DUTIES OF OFFICERS.

Section 1. The President will preside at all regular or special meetings of the Club and perform all duties pertaining

to a presiding officer; also serve as a member of the Executive Committee.

Sec. 2. The Vice President, in the absence of the President, will perform all the duties of that officer, also serve as a member of the Excutive Committee.

Sec. 3. The Secretary will attend all meetings of the Club or Executive Committee, keep full minutes of the'r proceedings, preserve the records and documents of the Club, accept and turn over all moneys received to the Treasurer at least once a month, draw cheques for all bills presented when approved by a majority of the Executive Committee present at any meetings of the Club, or Executive Committee meeting. He shall have charge of the publication of the Club proceedings and perform other routine work pertaining to the business affairs of the Club under the direction of the Executive Committee.

Sec. 4. The Treasurer shall receipt for all moneys received from the Secretary and deposit the same in the name of the Club within thirty days in a bank approved by the Executive Committee. All disbursements of the funds of the Club shall be by cheque signed by the Secretary and Treasurer.

Sec. 5. The Executive Committee will exercise a general supervision over the affairs of the Club and authorize all expenditures of its funds. The elective members of this Committee shall also perform the dut'es of an auditing committee to audit the accounts of the Club at the close of a term or at any time necessary to do so.

Article VI.

ELECTION OF OFFICERS.

Section 1. The officers shall be elected at the regular annual meeting as follows: except as otherwise provided for.

Sec. 2. Written forms will be mailed to all the members of the Club, not less than twenty days previous to the annual meeting, by the three elective members of the Executive Committee. These forms shall provide a method, so that each member may express his choice for the several offices to be filled.

Sec. 3. The three elective members of the Executive Committee will present to the President the names of the members receiving the highest number of votes for each office, together with the number of votes received.

Sec. 4. The President will announce the result of the ballot and declare the election.

Sec. 5 Should two or more members receive the same number of votes, it shall be decided by a vote of the members present, by ballot.

Article VII.

AMENDMENTS.

Amendments may be made to this Constitution by written request of ten members, presented at a regular meeting and decided by a two-thirds vote of the members present at the next regular meeting.

BY - LAWS.

Article I.

MEETINGS.

Section 1. The regular meetings of the Club shall be held at Pittsburgh, Pa., on the fourth Friday of each month, except June, July and August, at 2:00 o'clock P. M.

Sec. 2. The annual meeting shall be held on the fourth Friday of October each year.

Sec. 3. The President may, at such times as he deems expedient, or upon request of a quorum, call special meetings.

Article II.

QUORAM.

At any regular or special meeting nine members shall constitute a quorum.

Article III.

DUES.

Section 1. The dues of members shall be $2.00 per annum, payable in advance, on or before the fourth Friday of September each year.

Sec. 2. At the annual meeting members whose dues are unpaid shall be dropped from the roll after due notice mailed them at least thirty days previous.

Sec. 3. Members suspended for non-payment of dues shall not be reinstated until all arrearages have been paid.

Article IV.

ORDER OF BUSINESS.

1—Roll call.
2—Reading of the minutes.
3—Announcements of new members.
4—Reports of Committees.
5—Communications, notices, etc.
6—Unfinished business.
7—New business.
8—Recess.
9—Discussion of subjects presented at previous meeting.
10—Appointments of committees.
11—Election of officers.
12—Announcements.
13—Financial reports or statements.
14—Adjournment.

Article V.

SUBJECTS—PUBLICATIONS.

Section 1. The Executive Committee will provide the papers or matter for discussion at each regular meeting.

Sec. 2. The proceedings or such portion as the Executive Committee may approve shall be published (standard size, 6x9 inches), and mailed to the members of the club or other similar clubs with which exchange is made.

Article VI.

The stenographic report of the meetings will be confined to resolutions, motions and discussions of papers unless otherwise directed by the presiding officer.

Article VII.

AMENDMENTS.

These By-Laws may be amended by written request of ten members, presented at a regular meeting, and a two-thirds vote of the members present at the next meeting.

List of Charter Members.

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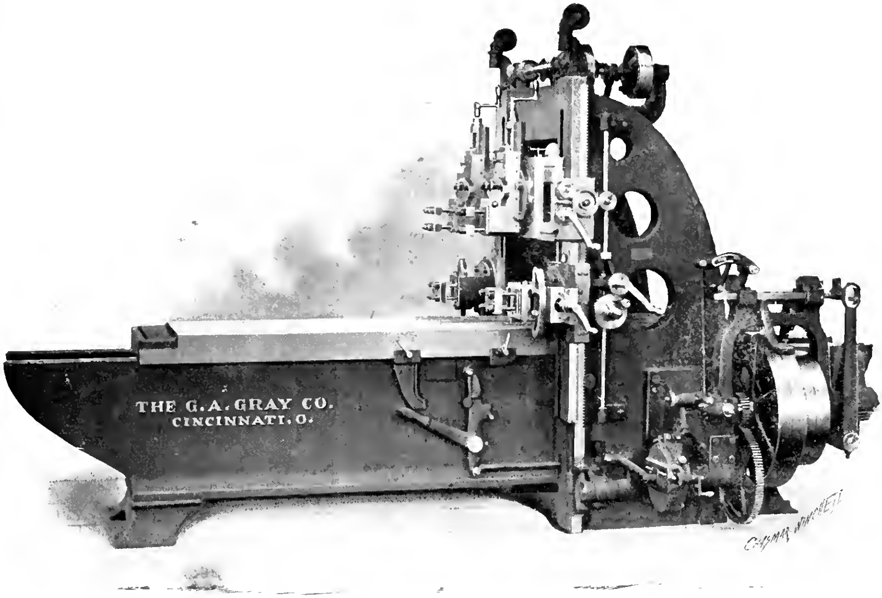
THE G.A. GRAY CO.
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Classified Index of Advertisements

OFFICIAL PROCEEDINGS

of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, DECEMBER, 27, 1901.

The meeting was called to order at 2:00 o'clock P. M., at the Hotel Lincoln, with President J. H. McConnel in the chair.

The following gentlemen registered:

MEMBERS.

Anderson, Thomas,	McConnell, J. H.,
Blattner, Joseph,	McFeatters, F. R.

Brown, John T.,
Conway, J. D.,
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Hyndman, F. T.,
Jones, Col. D. P.,
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Schmoll, G. A.,
Simons, J. E.
Stucki, A.,
Turner, J. S.,
Watts, H. W.,
Wright, R. V.

VISITORS.

Maher, P.,
Reese, F. T.,

President :—Gentlemen, please come to order. The first order of business is the reading of the minutes of the last meeting, as they are printed in the Journal, I presume we can dispense with the reading to-day. What is your pleasure? Upon motion of Mr. H. W. Watts, duly seconded, the minutes of the last meeting were approved as printed.

President :—Any announcements of new members, Mr. Secretary?

Secretary :—The following gentlemen have applied for membership to this club, and their applications have been approved by the Executive Committee :

John Hare, Rep. the Niles Tool Works Co., Pittsburgh, Pa.

Ira C. Hubbell, President, Locomotive Appliance Co., Chicago, Ill.

J. W. Kincaid, Rep. Day-Kincaid Stoker Co., Cincinnati, Ohio.

M. C. VanHoossen, Rep. Fuller Bros. & Co., New York, N. Y.

Frank B. Ward, Manager, the Niles Tool Works Co., Pittsburgh, Pa.

President :—In accordance with Article 111, Sec. 1, these gentlemen are duly elected to membership.

President :—Mr. Secretary, have we any reports from Committees?

Secretary :—I know of no reports Mr. President.

President :—The next order of business is communications, notices, & etc.

Secretary :—Reads the following letters:

Chicago, Dec. 19, 1901.

Mr. J. D. Conway,

Secretary Railway Club of Pittsburgh,

Pittsburgh, Pa.

Dear Sir—Your communication of November 22d, offering greetings to the Western Railway Club, was read at the meeting on the 17th inst., and on motion, duly seconded, I was instructed to extend to the Railway Club of Pittsburgh the congratulations of this club on its auspicious organization, and advise you that it will afford the members of this club great pleasure to visit you when we have an opportunity.

Yours truly,

JOS. W. TAYLOR

Secretary.

Nov. 29th, 1901.

Mr. J. D. Conway,

Secretary The Railway Club of Pittsburgh,

Gen'l Offices P. & L. E. Ry., Pittsburgh, Pa.

Dear Sir—I beg to acknowledge receipt of your favor of the 22d inst., announcing the organization of a Railway Club at Pittsburgh, and on behalf of the North-west Railway Club, beg to extend greeting. Yours truly,

T. W. FLANNAGAN,

Secretary.

St. Louis Railway Club.

St. Louis, December 4, 1901.

Mr. J. D. Conway,

Secretary Railway Club of Pittsburgh,

Pittsburgh, Pa.

Dear Sir—I beg to acknowledge receipt of yours 22d ult., advising of the organization of your Club, which starts out with such a large list of charter members, and to extend greetings and wishes for your continued growth. Your letter will be read before the December meeting, and I am sure when any of our members visit Pittsburgh, your Club will be considered one of the attractions. Yours truly,

E. A. CHENERY,

Secretary.

Unfinished and new business was passed without anything being presented.

President :—The next thing in order is "recess," as we have been in session but a short time, I think it would be better to take up the question of the paper for the day, and would therefore ask Mr. Wright if he will not kindly present and read his paper.

The Steam Engine Indicator in Locomotive Practice.

BY ROY V. WRIGHT, MECH. ENGR., P. & L. E. R. R.

The steam engine indicator has been developed and improved until one acquainted with it in its original form would not recognize it in its present state. Possibly one of the reasons why it has reached its present high state of development is the fact that, as it became more and more used on locomotives, it was necessary to bring it to a high state of efficiency in order that it could be successfully handled by a man perched out on the steam chest, and rushed along at the rate of seventy or eighty miles an hour, or what is probably worse, traveling at the rate of thirty miles an hour on one of our newer lines.

Certain it is, that its value as a means of studying the steam distribution in the locomotive and the problems involved therewith, and of thus being instrumental in bringing the locomotive to a its present high state of efficiency, cannot be over estimated.

While there are a number of roads which realize its importance and use it freely, yet there are a large number of them which seem to have overlooked the advantages to be gained by its use almost entirely. From those who are using it we hear its value highly spoken of, and the very fact that they continue to use it as freely as they do is evidence in itself of its value to them.

The sentiment has been expressed, and possibly there is some truth in it, that the advantages of the indicator in locomotive practice have not been apparent to the practical man ; because it has been associated so closely with the elaborate tests, such as recommended by the Master Mechanics' Association. It is said these tests present a mass of data which simply swamps the ordinary man, and the doubt is even expressed if the mechanical experts understand it and know what it all means.

It may be true that this is one reason why the indicator is not more widely used, although I, for one, doubt if it has had very much to do with it. These so-called "elaborate tests" have certainly been of value as a means of allowing the mechanical engineer to intelligently study and improve the design of the locomotive, even if some of the data found was superfluous or seemed so.

It is also true that while comparatively only a few of these elaborate tests have been made, a large number of simple and important tests and investigations have been, and are being made, and the results often published, and anyone looking over these cannot but realize the important part which the use of the indicator plays in them.

Probably the chief reason why it has not been more widely used is the fact that the men in authority have not had the time to look into the advantages to be gained by its use, or if they have, had not had the time to use it.

Nothing has done so much for the upbuilding and perfecting of the stationary engine as the use of the indicator. It is the practice among leading builders to indicate every engine before it leaves their works, in order to make sure that it is in proper condition. They consider the indicator as an indispensable instrument to their business.

Who ever heard of a locomotive builder indicating a locomotive before it left the works unless it was particularly specified, and how many times is it thus specified? Have we reached a higher state of efficiency in locomotive building than has the stationary engine builder, or, is it because the problem of steam distribution is more simple in the locomotive? Is the stationary engine so much more important, or costly, or is a saving of fuel, or an increase of efficiency in it of more importonce than in the locomotive? How often do we find a stationary engine that is not plugged for an indicator connection, and on the other hand, considering our railroads as a whole, how many of the locomotives do we find plugged for indicator connection, and of these, how many have but one cylinder plugged?

It has been said that it requires more time and expense to indicate a locomotive, but is not the additional expense justified when we consider the relative value and possible savings to be made in the two classes of engines?

We have the steam gauge, the water glass and the gauge cocks to let us know what is going on inside the boiler. The air

gauge shows whether the air is doing what it should. Likewise, the steam engine indicator shows what is going on in the cylinders. Of all the perplexing problems that come before the motive power department, that of the steam distribution in the locomotive is one of the most important, and to get the best results, we should know just what the steam is doing after it leaves the boiler and passes into the steam chest and cylinders, and out through the stack.

It is true we get some idea of the efficiency of the locomotive by the way it gets the trains over the road ; but we are not sure that it is doing its best, or that it cannot be improved, unless we know exactly what is going on in its cylinders.

We are continually changing the designs of our locomotives in order to improve their efficiency, or to meet changed conditions. Some roads draw up these designs in their own drafting room, while others have the builder design them to meet local conditions. As these locomotives go out into service and are experimented with, it is usually found necessary to make some changes in the design to get the best results. Sometimes the heating surface or grate area is not quite right ; someti nes it is the arrangement of the front end, and sometimes something else. How many of our roads examine carefully into the steam distribution by means of the indicator to see if it can be improved upon ? Have we grown so proficient in designing the valve gear, cylinders, etc., that a mistake cannot be made in them as in the other parts? Cases have been known where the mechanical department has studied long and hard to find out what was wrong with a locomotive, and then when the indicator was appealed to, as a last resort, the problem was easily solved.

It has also been of great value in developing and showing forth the advantages and disadvantages of the various types of locomotives which have been introduced. This is particularly true of the various compound engines and of locomotives fitted with the piston valve. It has also demonstrated clearly the value of certain valves, valve gear, etc.

It is not only on new locomotives that the indicator should be used. Conditions in railroad operation and management have changed very materially during the past few years. Business has increased greatly in volume and competition has also increased. Costs are now worked out on the ton mile basis, and the system of engine ratings has been introduced. It is essential that every piece of equipment be kept at its highest point of efficiency, and that it

be worked up to its full capacity. We cannot afford to have a locomotive pull only 2450 tons of freight over the road, if it is capable of pulling 2500 tons. Neither can we afford to have a passenger train losing time on the road if it is possible to prevent it.

The old locomotives have had to meet these new conditions. Working them up to their limit it has often been found that they cannot do the work that they should do on account of defects. The use of the indicator is of great value in locating these defects, and as an aid in redesigning these locomotives to be better able to meet the new conditions.

The indicator should be used as an aid in setting the valves. The conditions when the locomotive is in service and running at its usual cut-off and speed are entirely different from what might have been expected when the valves were set in the shop. This difference is due to vibration of the valve gear, and in some instances springy valve gear, etc. The setting of the valves should be checked by the use of the indicator to see that they are right for the usual running condition.

It does not require an expert to handle the indicator. It is a simple instrument, but must be handled carefully to get accurate results. Neither does it require an expert to make deductions from the indicator card, although it does require some study and thought to draw the right conclusions, especially if the problem happens to be a complicated one.

The indicator does not tell you in so many words that the steam passages are too small; that the valve gear is out of order, or that the valves are badly designed, or that something else is wrong. It simply records exactly what is going on in the cylinder, provided the proper precautions have been taken in setting up the indicator and taking the card. It shows the exact pressure in the cylinder at each part of the stroke. The different events of the stroke can be located by the lines on the diagram. Experience and a study of these cards teach us where these points should be located in order to gain the best results under different conditions. If the card, therefore, shows these events where they should not be, or if the card is distorted, or if the diagram for one end of the cylinder differs from that of the other end, or if the cards for the two engines differ, then we know that something is wrong, and the question is to locate it. With a little study and experience the difficulty can usually be easily located, but it very often happens, where the

defects are complicated, that considerable study and some experimenting are necessary before the problem can be completely solved.

If there is anything wrong with the steam distribution the indicator will show it.

A number of books and treatises have been written on the steam engine indicator and its application to the stationary engine. Several of these make a complete study of the stationary engine indicator card, and anyone interested in indicating stationary engines, can easily find all the information he may desire, either as to the application of the indicator to the engine, or as to the defects in the engine as shown by the indicator card.

While the indicator card from a locomotive is, in general, the same as that from the stationery engine yet it presents many differences. As far as the writer knows their is no treatise which treats of the application of the indicator to the locomotive and enters into the study of the locomotive indicator diagram and covers the subject fully. Probably the most complete article on the subject is a committee report made to the Traveling Engineers Association in 1900.

At various times, however, during the past few years, papers or reports have been presented before our railway associations or clubs, and articles have appeared in our railway technical papers which have treated of different phases of this subject, and have contained valuable information to one interested in this work. Also, as different types of locomotives or different appliances which affect the steam distribution have been tested, indicator cards have been taken, and from time to time some of those which were of particular interest because they showed up good or bad points in the locomotives, have been published.

These articles are of course widely scattered and valuable contributions on this subject are often overlooked by the man, most needing them, because he does not know just where they can be found and has not the time to hunt them up. It is a lamentable fact that some of our railway club proceedings and technical papers are very, very badly indexed. One may sometimes examine the index of a volume for certain information and come to the conclusion that it is not there, and a few days later, while casually looking over the same volume, may find exactly what he had been looking for. On referring back to the index the article will be found under an obscure or entirely inappropiate title. Then again

an article on a general subject may contain valuable information along several different lines, but of course, only the general subject will appear in the index.
those interested in this work.
such things; but the railway mechanical man of to-day has such a
A card index furnishes a splendid scheme for keeping track of wide range of subjects coming before him, and is usually so badly rushed that, unfortunately very few of us succeed in keeping our card index up to date, if inpeed, we ever manage to get it started.

Sometime ago the writer had occasion to give the subject of indicating locomotives some study, and because of the difficulty in getting together the desired information, it seemed that the references which he had, if properly arranged, might prove of value to those interested in this work.

While the list may not be complete it probably contains the most important articles which have appeared in the various railway club proceedings and papers during the past few years.

REFERENCES.

ABBREVIATIONS:

Am. Engr.—	American Engineer and Railroad Journal.
Ry. Gaz.—	Railroad Gazette-
Ry. and Eng. Rev.—	Railway and Engineering Review.
Loco. Engr'g.—	Locomotive Engineering.
Trav. Engrs. Assn.—	Traveling Engineers Association.

Indicator—Air Brakes, Action of as shown by the

Northwest Railway Club, March 10, 1896, page 17.
By W. O. Johnson. St. P. & D. R. R.

Indictor—Application to Locomotives.

Master Mechanics' Assn., 1883, page 241.
Practical paper with details of rigging.
Master Mechanics' Assn., 1893, page 32.
Under report on "Standard Locomotive Tests."
Master Mechanics' Assn., 1894, page 175.
Under report on "Standard Locomotive Tests."

Master Mechanics' Assn., 1901, page 335.

Under report on "Standard Locomotive Tests."

Western Railway Club, 1899-1900, page 377.

Under article on "Locomotive Road Tests—How they should be made," by Prof. L. P. Breckenridge.

Describes method of piping to indicator.

Also a special cord bracket used for a simple start and stop motion on indicator. (See also Ry. Gaz., 6-17-98, page 432.) (good.)

Trav. Engrs. Assn., 1900, page 145.

Recommendations made to its members.

Indicator—Application to Locomotives—Compound.

Trav. Engrs. Assn., 1900, page 132.

Baldwin—Vauclain.

Trav. Engrs. Assn., 1900, page 129

Richmond.

Trav. Engrs. Assn., 1900, page 126.

Schenectady.

Indicator—Automatic.

Am. Engr., 1897, page 5.

Western Ry. of France. No connection with crosshead.

Indicator—Automatic. (Cont'd.)

Operator not needed at the front end. Complicated but gave good service.

Indicator Card Takers—A Device of Value to

Am. Engr., 1895, page 446.

Simple device for taking up sudden shock on cord when detent is thrown in or out.

In taking cards press pencil lightly or diagram may be changed considerably.

Indicator Cards—Allen Valve.

Ry. Gaz., 6-30-99, page 470.

"The Allen Valve for Locomotives," by C. H. Quereau. Set of cards showing that back pressure with the Allen valve is not excessive if valve is set right.

Trav. Engrs. Assn., 1900, page 106.

Indicator Cards—Allfree Valve Gear.

Railway Master Mechanic, 1900, page 492.

"A Study of Indicator Cards," by Ira C. Hubbell, showing

advantages gained by the Allfree valve gear.

Indicator Cards—"Chautauqua Type."

Am. Engr., 1901, page 104.

C. R. I. and P. R. R. 20¼" x 26". Notable because of high horse power developed, namely, 1618 I. H. P. at 60 miles per hour.

Indicator Cards—Compound Locomotive.

Trav. Engrs. Assn., 1900, page 144.

Baldwin, Vauclain—Method of combining cards (page 141).

Am. Engr., June 1898, page 181.

Baldwin, 2 Cyl.—Norfolk & Western R. R. Cards taken while running compound and simple.

Ry. Gaz., 8-18-99, page 580.

Richmond with double ported valve.

Trav. Engrs. Assn., 1900, page 129.

Richmond.

Trav. Engrs. Assn., 1900, page 126.

Schenectady.

Am. Engr., Dec., 1901, page 380.

Schenectady, 23" and 35" x 32" and simple 20" x 28". Michigan Central tests.

Ry. Gaz., 6-16-99, page 423.

Tandem 15" and 25" x 28" Cons. and simple 21" x 28" Cons. A. T. & S. F. R. R. tests.

See "Indicator Cards—Drifting."

Two cylinder compound.

Indicator Cards—Cut offs, Effect of Different.

Trav. Engrs. Assn., 1900, page 103.

Indictor Cards—Cut off, Effect of Long.

Trav. Engrs. Assn., 1900, page 106.

Indicator Cards—Drifting, Effect of

Ry. and Eng. Review, 11-18-99, page 651. Also Proc. New York Ry. Club, 1899.

In article on "Some Deductions from Road Tests of Locos," by R. P. C. Henderson. Shows drifting cards for 2 Cyl. Comp., also simple engine with piston valve, and simple with plain valve. Should drift with reverse lever in corner, especially with piston valve.

Railway Master Mechanic, June 1900, page 293.

"The Rehabilitation of the Piston Valve," by R. F. Hoffman. Cards showing importance of having reverse lever in corner while drifting with piston valve.

Indicator Cards—Exhaust Nozzle, Effect of

Trav. Engrs. Assn., 1900, page 113.

Indicator Cards—Fuel Economy from Study of

Ry. Gaz., 12-29-99, pages 893 and 896, also So. & So. W. Ry. Club, Nov. 1899.

By W. E. Symons. Shows cards and describes case where 25% less fuel was used by remedying defect in piston. Defect located by use of indicator.

Indicator Cards—Horse Power Developed, High.

See "Indicator Cards—'Chautauqua Type.'"

See "Indicator Cards—'Northwestern Type.'"

See "Indicator Cards, Piston Valve—'Central Atlantic Type.'"

Indicator Cards—Ill. Central Tests.

Ry. Gaz., 6-17-98, page 433.

19" x 26", 10 Whl. Frt.; 21" x 24", 10 Whl. Frt.; 18" x 26" 8 Whl. Pass.

Indicator Cards—Lead. Effect of

Trav. Engrs. Assn., 1900, page 100.

Indicator Cards—Locating Events on

Ry. Gaz., 6-30-99, page 468.

"Locating Cut-Off and Other Events on Loco. Indicator Card," by A. H. Robertson. By means of a valve motion indicator used in connection with the steam engine indicator and which is fully described.

Indicator Cards—Locomotive.

Western Ry. Club, Dec., 1900, page 197.

Under article, "Suggestions as to Fuel Economy," by Ira C. Hubbell. Locomotive cards compared to those from a stationary engine. Loco. cards indicate presence of three serious losses. 1. A high relative terminal pressure as compared to M. E. P. 2. Additional waste resulting from excessive clearance. 3. Excessive back pressure.

Indicator Cards—Lubrication Insufficient, Effect of

Western Ry. Club. April, 1897, page 376.

Trav. Engrs. Assn., 1900, page 106.

Indicator Cards—Northwestern Type.

Am. Engr., Oct., 1900, page 305, and Nov., 1900, page 335.

C. & N. W. R. R. 20″ x 26″. Showing effect of good steam and exhaust passages. Remarkable for high horse power developed and long sustained power.

Indicator Cards—Paper, Metallic.

Mix zinc white or oxide of zinc, in dry form, with thin mucilage, as gum arabic, into a paste as thin, or thinner, than whitewash. Spread on paper with a brush or float paper upon a bath. Stir up solution, as zinc sinks to bottom. Use paper a little heavier than for pencilled paper. Use a brass point instead of lead pencil. (Prof. H. Wade Hibbard.)

Indicator Cards--Pipes, Effect of long

Am. Engr., June, 1896, page 112.

"Effect upon diagrams of long pipe connections for steam engine indicators," by Prof. W. F. M. Goss. Experiments made on stationary engine with different lengths of pipe.

SUMMARY OF RESULTS.

1. If an indicator is to be relied upon to give a true record of the varying pressure and volumes within an engine cylinder, its connection therewith must be direct and very short.

2. Any pipe connection between an indicator and an engine cylinder is likely to affect the action of the indicator; under ordinary conditions of speed and pressure a very short length of pipe may produce a measureable effect in the diagram, and a length of three feet or more may be sufficient to render the cards valueless, except for rough or approximate work.

3. In general the effect of the pipe is to retard the pencil action of the indicator attached to it.

4. Other conditions being equal, the effect produced by a pipe between an engine cylinder and an indicator become more pronounced as the speed of the engine is increased.

5. Modifications in the form of the diagram resulting from the presence of a pipe are proportionately greater for short cut-off cards than those of longer cut-off, other things being equal.

6. Events of the stroke (cut-off, release, beginning of compression) are recorded by an indicator attached to a pipe, later than the actual occurrence of the events in the cylinder.

7. As recorded by an indicator attached to a pipe, pressures during the greater part of expansion are higher, and during compression are lower than the actual pressures existing in the cylinder.

8. The area of diagrams made by an indicator attached to a pipe may be greater or less than the area of the true card, depending upon the length of the pipe ; for such lengths as are ordinarily used, the area will be greater than that of the true cards.

Indicator Cards—Pipes, Effect of long (Cont'd.)

9. Within limits, the indicated power of the engine is increased by increasing the length of the indicator pipe.

10. Conclusions concerning the character of the expansion or compression curves, or concerning changes in the quality of mixture in the cylinder during expansion or compression are unreliable when based upon cards obtained from an indicator attached to the cylinder, through the medium of a pipe, even though it is short.

Trav. Engrs. Assn., 1900, page 100.

Indicator Cards—Piston Valve.

Ry. Gaz., 10-14-98, page 735.

Cards from G. N. Ry., 10 Whl. 20" x 30". Showing good effects of piston valve and large steam passages.

Ry. Gaz., 1901, page 54.

A. T. & S. F. R. R., 10 Whl. Pass., 20" x 28". Showing that with a piston valve compression can be held down to a point which is not detrimental if no special relief device is used.

New York Ry. Club, Nov. 1901.

Under "Recent Locomotive Construction and Performance," by F. J. Cole. Set of cards from N. Y. Central, "Central Atlantic Type." Notable for high horse power developed.

Railway Master Mechanic, June, 1900, pages 293 and 542.

Under "The Rehabilitation of the Piston Valve," by Robt. T. Hoffman. Cards showing good distribution of steam with piston valve and importance of having reverse lever in corner while drifting.

See "Indicator Cards—Drifting."

Indicator Cards—Speed, Effect of Different

Trav. Engrs. Assn., 1900, page 103. Also page 124.

Indicator Cards—Steam Chest.

Trav. Engrs. Assn., 1900, page 109.

Indicator Cards—Valve Setting by

Trav. Engrs. Assn., 1900, page 117.

Indicator Cards—Valves Set Bad.

Loco. Engr'g., July, 1900, page 284.
G. Weldin—Plant System.

Indicator—Integrating.

Ry. Gaz., 8-12-98, page 576.
L. & N. tests. Designed by Prof. C. S. Brown.

Indicator—Loco., Application to

See "Indicator—Application to Loco."

Indicator—Loco. Practice, in

Pacific Coast Ry. Club, Feb. 1900.
By Howard Stillman.

Indicator—Locomotive Work.

Trav. Engrs. Assn., 1900, page 94.
"The use of the steam engine indicator as an aid to the trav-

Indicator—Locomotive Work. (Cont'd.)

eling engineer to determine the efficiency of the loco. in service and the benefit derived therefrom." (Note—As far as the application of the indicator to the locomotive and the study of cards obtained by it from locomotives is concerned, this is the most extensive article the writer has noticed, and a synopsis of it is therefore given.)

SYNOPSIS.

Why it has not been more generally used.
Why it should be used.

Part No. 1—The Simple Engine.

Spring—Scale of the, effect of - - - - -	Page 100
Stroke—Locating events of the - - - - -	"
Lead—Effect of excessive and negative - - - -	"
Pipes—Effect of long indicator - - - - - -	"
Cut-Offs—Cards at different - - - - - -	103
Speeds " " " - - - - - - - -	"
Lubrication—Effect of insufficient - - - - -	106
Cut-Off—Cards at long - - - - - - -	"
Allen ported valve - - - - - - - -	"

Part No. 2—The Compound Engine.

Recommendations of Committee.

Part No. 3.

Part No. 4.

Cuts, descriptions, explanations and instructions as to the use, care and merits of the different makes of indicators and the calculating instruments which accompany them.

Indicator Reducing Motion.

Trav. Engrs. Assn., 1900, page 137.

Baldwin Loco. Wks. Pendulum or swing motion.

Am. Engr., 1895, page 493.

Flint & Pere Marquette Ry. Used with 4 Bar guides. Not good at high speed on account of the vibration of the top part.

Ry. Gaz., 6-17-98, page 432.

Illinois Central Ry.—Freight engines. Placed alongside of cylinder. A little too low to handle conveniently. Severe strains on upper and lower links on account of vibration.

Ry. Gaz., 6-17-98, page 432.

Illinois Central Ry.—Pass. engines. Simple and gave good satisfaction. Indicator placed alongside of steam chest, but not low enough to be inconvenient. Double slotted lever reducing motion.

Master Mechanics' Assn., 1893, page 32.
" " " 1894, page 175. Same.
" " " 1901, page 335.

M. M. Assn. Drawings of adjustable and non-adjustable pantograph reducing motion as recommended.

Master Mechanics' Assn., 1894, page 190. Same.
" " " 1901, page 349.

Norfolk & Western Ry.—Description and drawings.

Am. Engr., June, 1896, page 119.

P. R. R.—Adjustable. Workmanship must be excellent to prevent lost motion. A little too flexible laterally. Pantograph.

Am. Engr., Sept., 1896, page 206.

P. R. R.—Simple, substantial, and except for one lever adjustable.

Trav. Engrs. Assn., 1900, page 150.

Plant System—High speed. Placed at side of cylinder.

Trav. Engrs. Assn., 1900, page 149.

Plant System—Slow speed or where object is valve adjustment only.

Trav. Engrs. Assn., 1900, page 148.

Purdue Univ.—Used on Schen. No. 2. Simple, durable non-adjustable.

Master Mechanics' Assn., 1893, page 32.

Swing or Pendulum reducing motion should not be used.

Indicator—Testing, Method of

Ry. Gaz., 12-30-98, page 929.

By D. S. Jacobus. Apparatus fully described and illustrated.

Indicator—Uses of.

Ry. Gaz., 5-26-99, page 370.; also New Eng. Ry. Club, Apr., '99.

By Edw. F. Miller. Illustrated article showing defects as brought out by cards from Corliss engine.

Also cards from—

Deane Independent Air Pump.

Westinghouse Air Brake Pump.

Vauclain 4 Cyl. Compound.

Indicator—Valve Gear, Improvement of by use of

Am. Engr., Oct., 1901, page 320.

Plant System—Set of cards showing the effect of springy valve gear, small nozzles and restricted port openings.

Indicator—Valve Motion

See "Indicator Cards—Locating Events."

President :—Gentlemen, as a rule the discussion of a paper does not take place at the same meeting at which it is presented, and this matter will be brought up for general discussion at the next general meeting, in order to give every one an opportunity to look the paper over and make up their minds as to what they want to say, but if there is any one here who would like to ask Mr. Wright any questions, he would be glad, I am sure, to answer them.

President :—I see Col. Jones with us to-day ; he has had quite an experience on the subject, I am sure.

Col. D. P. Jones :—Mr. President, I consider the paper a most admirable one, but as my experience has been confined almost entirely to land and marine boilers, and not to locomotive work. I can readily see its tremendous force as applied to the general locomotive. We have accomplished wonders in marine construction ; we have demonstrated that we can get a horse power for a little less than 2 lbs. of coal ; yet I feel that the indicator has had more to do with the perfection of the locomotive than anything else. Take it, for instance in our naval service. It was an obligatory thing to fit indicators four times a watch, and if there was anything odd or unusual it could be discovered at once. Take those high grade engines, for instance, I have found it of tremendous advantage in locating any unusual proceeding upon the part of the engine. Suppose you are troubled with the valve gear, which has been crudely set, or something of that sort. We have started out from the navy yard ; have had the valves set to perfection, and after running some few days there is something wrong, and I have never yet failed to consult the indicator, and there was the trouble plainly indicated on that little card. I think that is one of the reasons why we have attained such perfection in our navy, because we are doing more than all the navies of the world are doing, and that is the reason we have got the marine engines to the efficiency that they are to-day. Next to the genius of the man we can trace the bulk of the good to the indicator valve. I do not think everyone can handle an indicator ; it is necessary to have a delicacy of touch ; it must be handled delicately and quickly. I do think, however, that it is within the range of any man to learn ordinarily how to handle one.

Mr. H. W. Watts:—Inasmuch as this is a subject connected especially with the motive power department, and as we have several members here who know absolutely nothing of this subject, I would suggest that we have at the next meeting a paper showing just what the indicator is and how it acts.

President:—I believe Mr. Wright would be glad to explain to us how the indicator works.

Mr. Wright:—The indicator records on a sheet of paper a diagram which shows the exact pressure of the steam in the cylinder at every point of the stroke. It consists of two parts, a revolving drum which carries the paper, and a small steam cylinder containing a piston, which is connected with the pencil motion. The revolving drum is connected with the cross-head, but since the drum can only be revolved four or five inches, while the stroke of the engine is much greater, it is necessary to reduce the motion by introducing a reducing rigging. The drum therefore revolves back and forth at the same time as the piston moves back and forth in the cylinder. The cylinder of the indicator is connected directly with that of the engine. Fitted into this cylinder is a small piston which works against a spring placed above it, and which has been carefully made and calibrated. As the pressure in the cylinder varies, the piston moves up or down, and with it the pencil motion. The pencil records the pressure on paper on the revolving drum, and since this moves back and forth with the piston we have a complete and accurate report of what is going on in the cylinder.

President:—Would you have an opportunity between now and the next regular meeting of getting up a blue print showing the position of the indicator. I think in this way we can all get a much clearer idea of what it is.

Mr. Wright:—I believe I can.

Col. Jones:—I think if Mr. Wright would bring an indicator with him it would be a good plan; that talks. Any man of intelligence can see how wonderfully it works.

President:—It is understood, of course, that this subject is open for discussion at the next general meeting, and I hope we will have some experts here in addition to Mr. Wright who can give us some information on this subject. The next thing in

order is the discussion of subjects presented at the previous meeting. That would bring us at this point to a discussion of Mr. Simons' paper on "The relation of the young man to our Club."

Col. Jones:—Mr. President, I seem to be much in evidence, but I would like to say something on that paper. It appeals to every man here with a little grey in his hair. We notice how much the younger men are coming forward compared to the way we came forward in our time, and how younger men are grasping these great problems and solving them too. I did not feel in my day that I knew it all and could do it all. It has been a great problem, and it is a great compliment to the young men of to-day that all these great institutions which are growing with such wonderful strides, are presided over by them. In our earlier days we had no such opportunities of learning. The books of reference were limited, but with the young men of to-day they are just as well equipped at thirty as we were at forty or fifty, and I thought Mr. Simons' paper illustrated this point very well. It gave me a good reason for it. That has been a subject which has worried me a great deal. I thought I was something in my day, but I feel a very minute affair compared with the young men managing the works of to-day. I think Mr. Simons' paper contained the rationale of the whole thing. The young men have to keep up with the march of improvements, the march of events.

Mr. Simons:—Mr. President, I feel as though I must say something to thank Mr. Jones for his kind expression. In regard to the subject under discussion, I do not know that I can add much more to it than Mr. Jones has said, or what I have already said in the paper. I do not know how it is with most of the men in large departments, but I know, speaking from my own experience, a man is disposed to shirk as much as possible and let the other fellow do it, and I think there is nobody better able to do it than the young man. Get hold of him; give him a start; give him plenty to do. He wants to know how to do it, and you will develop him much quicker in that way than if you try to keep him in the back-ground. At the same time that you are developing him or trying to develop him you are not hurting yourself. It is necessary, I think, for men in charge of departments, or in executive capacities, to have gone through a

certain amount of experience, and unfortunately, in years gone by, those men that are now in executive positions had not the opportunity that the young men come into the field with to-day, and consequently they did not reach those positions as fast as the young men of to-day.

President:—Is it not also true that there are not enough old men to go round?

Mr. Simons:—There may be something in that.

Mr. H. W. Watts:—The greatest steel corporation in the world has furnished the greatest object lesson of Mr. Simons' position, and it is that which more than anything else has given America its present financial and manufacturing supremacy. When I went to the general offices of the Carnegie Steel Company in search of certain information, I first sent my card to the Vice Chairman, who a few years before had acted as Santa Claus for me at a Christmas celebration. I was directed to one of the heads of departments. I went to the office, and I saw no one there except a boy at a desk. I asked for Mr. So and So. He said, "I'm the man." I told him what I wanted, and in two minutes I had a note of introduction to the manager of one of the mills, and I found another young man there not much older than the one I had just met, but it impressed me as a fact that that company owes its great success very largely to the energy of the young men, supplemented by the knowledge of those who had gone before.

President:—Are there any committees to be appointed, Mr. Secretary?

Secretary:—There are none.

Mr. J. E. Simons:—One thing I wish to say on behalf of the Executive Committee, and that is this: this matter of subjects for meetings is one most interesting, and the Executive Committee is called upon to make arrangements for those subjects. As you understand, the committee is limited to three, not including the President and Vice President, both of whom are ex-officio members. It occurs to me that there may be a better opportunity to select subjects from 200 minds than from four or five, and anyone who has an idea on a subject can submit it to the Executive Committee and it will be glad to have it presented.

The matter of a question box has been discussed, whereby when something occurs to a member during the interim between meetings and he can come here and make known a subject which he thinks would be interesting to discuss, and the Executive Committee could make proper arrangements for its presentation to the club.

President :—Have any gentlemen got anything to offer for railway clubs in general, or this club in particular?

Mr. Slocum :—With reference to a place of meeting, have the Executive Committee only power to report to the meeting, or have they power to act?

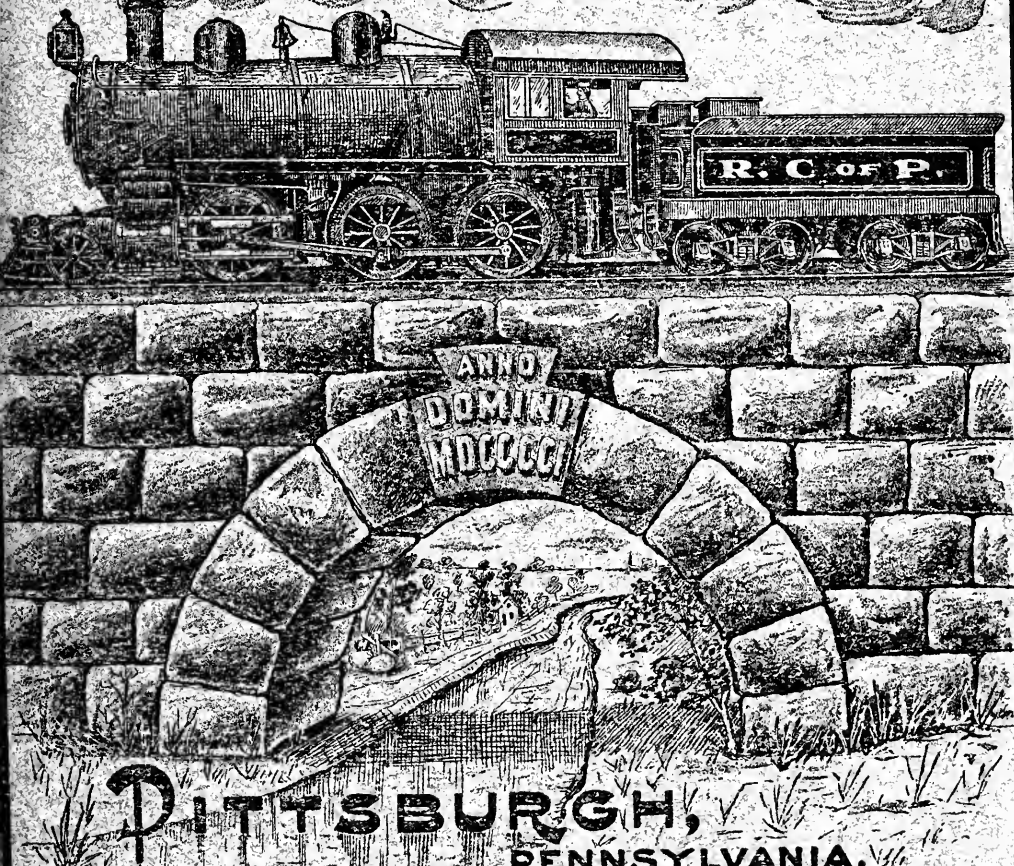
President :—The Executive Committee have power to secure suitable room ; it is entirely in their hands. It seems to me that we should continue to hold our meetings here until the room gets too small for our purposes. For a great majority of meetings this room would be ample.

Secretary Conway here made an announcement relative to the Journal, advertising, etc., reporting excellent results so far attained and a good field yet to be canvassed, and announced the membership at present as 206.

There being no further business before the meeting, it was duly moved and seconded to adjourn. Motion carried and meeting adjourned.

RAILWAY CLUB OF PITTSBURGH

OFFICIAL PROCEEDINGS.



PITTSBURGH, PENNSYLVANIA.

JANUARY 1902.

Classified Index of Advertisements

Index—Continued.

OFFICIAL PROCEEDINGS

of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

OFFICERS, 1901 - 1902.

President,
J. H. McCONNELL,
Manager American Locomotive Co., Pittsburgh, Pa.

Vice-President,
L. H. TURNER,
Supt. Motive Power, P. & L. E. R. R.
Pittsburgh, Pa.

Treasurer,
J. D. McILWAIN,
Sales Agent, J. D. McIlwain & Co.,
Pittsburgh, Pa.

Secretary,
J. D. Conway,
Chief Clerk, Supt. M. P., General Offices P. & L. E. R. R., Pittsburgh, Pa.

Executive Committee,

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Supt. M. P. Penna Lines West of Pgh.,
Ft Wayne, Ind.

J. E. SIMONS,
S. of R. S. & M., Pittsburgh Coal Co.,
Coraopolis, Pa.

F. T. HYNDMAN,
S. M. P., Bflo., Roch. & Pgh. R. R. Co.,
Du Bois, Pa.

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Published monthly, except June, July and August, by the Railway Club of Pittsburgh, J. D. Conway, Secretary, General Offices P. & L. E. R. R., Pittsburgh, Pa.

Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, JANUARY 24, 1902.

The meeting was called to order at 2 o'clock P. M., at the Hotel Lincoln, with President J. H. McConnell in the chair :

The following gentlemen registered:

MEMBERS.

Anderson, Thomas,
Bellows, A. B.,
Blattner, Joseph,
Brown, John T.,
Carson, G. E.,
Conway, J. D.,
Courtney, D. C.,
Dreyfus, Theo. F.,
Gearhart, H. J.,
Hubble, Ira C.,
Hukill, J. L.,
Hyndman, F. T.,
Kessler, D. D.,
Loetscher, E. C.,
Mason, E. S.,
McConnell, J. H.,
McIlwain, J. D.,
McNulty, F. M.,
Searles, J. R.,
Sherman, C. W.,
Slocum, Charles V.,
Slocum, A. W.,
Stark, B. F.,
Stovel, R. W.,
Stucki, A.,
Thomas, I. B.,
Turner, L. H.,
Whitney, Louis B.,
Wright, R. V.

VISITORS.

Barnes, Wm.,
Harried, A. W.,
Wheeler, F. A.,
Woods, Edwin S.,
Malone, T. E.,

President:—Gentlemen, if you will come to order, we will proceed with our regular business. As the minutes have been printed in the Journal, it is to be presumed that they are correct, and I therefore do not see any necessity of further approving them. Mr. Secretary, have you any announcements of new members?

Secretary:—The following gentlemen have made application for membership, and their applications have been duly approved by the Executive Committee:

John Cowan, M. C. B., P. R. R. Co., Verona, Pa.

Jas. E. McNary, M. E. Tranter, Davis Mfg. Co., Pittsburgh, Pa.

Jas. M. Richey, Pur. Agent, B. & L. E. R. R., Pittsburgh, Pa.

John R. Bowen, Chf. Inspector, Robt. W. Hunt Co., Pittsburgh, Pa.

Peter Maher, M. M., I. I. & I. R. R. Co., Kankakee, Ill.

E. O. Warner, Rep. Labtrobe Steel and Coupler Co., Philadelphia, Pa.

D. L. Markle, Asst. Manager, Illinois Car and Equipment Co., Chicago, Ill.

J. C. Grooms, L. and C. Agt., P. & L. E. R. R. Co., Pittsburgh, Pa.

Cary D. Terrell, Associate Editor, The Railway and Engineering Review, Chicago, Ill.

R. J. Crozier, of The Standard Supply and Equipt. Co., Pittsburgh, Pa.

A. O. Norton, Manufacturer, Boston, Mass.

W. E. Coffin, Rep. National Malleable Castings Co., Cleveland, O.

E. H. Anderson, Genl. Mangr. Pittsburgh Oil Refining Co,, Pittsburgh, Pa.

Daniel M. Brady, Prest. Brady Brass Co., New York, N. Y.

Ben Haas, Rep. Jos. Joseph & Bros. Co., Pittsburgh, Pa.

Ernest F. Slocum, Gen'l Agt. The Safety Car Heating and Lighting Co., New York, N. Y.

Wm. McConway, Jr., Supt. McConway & Torley Co., Pittsburgh, Pa.

E. M. Grove, Treas'r McConway & Torley Co., Pittsburgh, Pa.

Walter Macleod, Walter Macleod Co., Cincinnati, O.

Welling G. Sickel, V. Prest. United and Globe Rubber Mfg. Co., Trenton, N. J.

S. F. McKee, C. C. Penna. Car Wheel Co., Pittsburgh, Pa.

Jas. R. McTaggart, Manager Ft. Pitt Laboratory, Pittsburgh, Pa.

Raymond B. Brown, Manager Duquesne Reduction Co., Pittsburgh, Pa.

Fred. S. Weigle, Chf. Disp'r. P. & L. E. R. R. Co., Pittsburgh, Pa.

W. S. Galloway, Inspr. B. & O. R. R. Co., Pittsburgh, Pa.

The above gentlemen were declared elected to membership in this Club.

The Secretary then read a number of communications, among them the following letter :

Chicago, Ill., January 8, 1902.

Mr. J. D. Conway,
Secretary Railway Club of Pittsburgh,
Pittsburgh, Pa.

Dear Sir—I would like to suggest, if it is the intention of your Club to submit proposed changes in the Rules of Interchange for consideration by the Arbitration Committee, that the matter be given consideration not later than your April meeting, and that whatever recommendations you have to make be submitted to this office as soon thereafter as possible. The Arbitration Committee will probably meet the last week in April to formulate its report to the Association on the revision of the Rules, and if you have any suggestions to make they should be in this office prior to that time.

Yours truly,
JOS. W. TAYLOR,
Secretary Master Car Builders' Association.

President :—I would like to ask if the Executive Committee have not something to say on this letter of Mr. Taylor's ?

Mr. Simons :—In reference to this matter, Mr. President and gentlemen, I want to say that at a meeting of the Executive Committee held, at which were present President McConnell, Mr. Turner and myself, it was deemed wise to set aside one meeting for discussing changes that may be found necessary in the rules. The understanding arrived at was that there be a committee appointed at this meeting to go through the Interchange Rules and report at next meeting such changes as they might deem necessary, and then have those rules or changes come up for discussion at that time. The President is thoroughly familiar with that, and I presume he will ask the Club for action.

President :—Gentlemen, it has been customary in all of the Railway Clubs throughout the country to devote one meeting previous to the Master Car Builders' meeting in July to a discussion and suggestions as to changes in the M. C. B. rules, the results of which are sent to the Arbitration Committee and are incorporated in their report to the Association at the June meeting. It was suggested at the meeting of the Executive Committee that a committee be appointed at this meeting to ascertain

from the roads in the vicinity of Pittsburgh the necessity of changes in the M. C. B. rules and the result brought up at a meeting of the Club for discussion, when the Club would instruct the Secretary to notify the Secretary of the Master Car Builders' Association at Chicago what the views of the Pittsburgh Club were on this subject. This subject is now open for discussion, and it is hoped that everybody interested will give their views. Mr. Turner, what are your views on this matter?

Mr. Turner :—Personally I do not know just what changes are necessary in the Master Car Builders' rules. It was my understanding at the last meeting of the Executive Committee that each railway company in this vicinity would be requested to designate some one to represent them at the February meeting of this Club to offer suggestions or such recommendations as they had to make. It seems to me that would be a better procedure than to have a committee appointed to confer directly with the railroad companies, and in order to bring the matter before the meeting I offer this resolution :

"That the Secretary be instructed to notify each railroad company in this vicinity that changes in the Master Car Builders' rules will be discussed at the February meeting, and that they are requested to designate some one to represent them at that meeting."

The motion was duly seconded, put and carried unanimously.

Mr. G. E. Carson :—I think the move is a very good one. There are quite a number of rules that should be modified and changed. I think the steps taken are the proper ones.

President :—The next thing on the program will be a discussion of the paper offered by Mr. Wright at the last meeting, and I would ask Mr. Wright to open the discussion.

Mr. Wright :—Mr. President and Gentlemen : At our last meeting a request was made that the indicator and its application to the locomotive be described and illustrated at this meeting.

I have brought an indicator with me and have made a couple of drawings which I trust will make the matter clear to you all.

The various makes of the steam engine indicator are alike as far as the general principals upon which they are constructed are concerned.

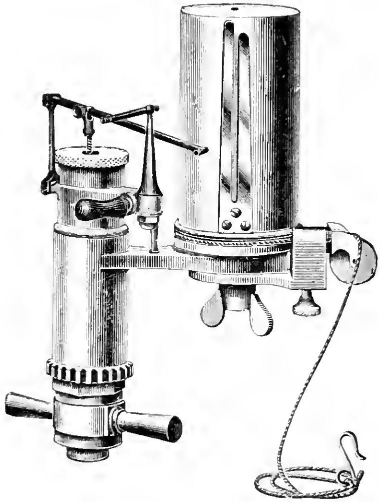


Fig. No. 1.

AMERICAN THOMPSON IMPROVED INDICATOR.
OUTSIDE VIEW.

I have illustrated the American Thompson Indicator because it is the make I have always used and am most familiar with. The drawing to my right (Fig. No. 2) shows a cross-sectional view of the indicator, and as you can see, it is about six times the actual size ot the machine.

The indicator consists of two parts, a steam cylinder and a paper drum. The steam cylinder of the indicator is connected up directly with the steam cylinder of the engine, and of course receives steam at the same time it does. Above the piston in the steam cylinder is a spring, which has been very carefully made and calibrated. The steam works the piston against the spring and the motion of the piston is transmitted by the system of levers to the pencil point. It is of course very important that the motion of the pencil point be exactly parallel to the motion of the piston, and the rods and levers which transmit the motion are so designed that this is true.

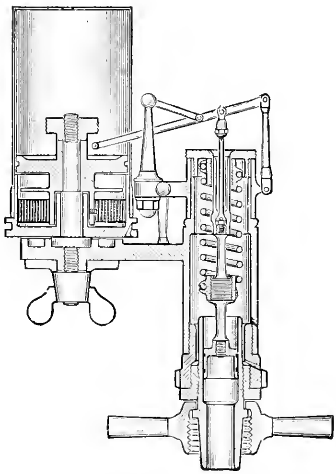


Fig. No. 2.

AMERICAN THOMPSON IMPROVED INDICATOR.
CROSS-SECTIONAL VIEW.

The drum which carries the paper upon which the record is to be made revolves back and forth as the piston moves back and forth in the cylinder. Since the pencil point records the pressure of the steam in the cylinder on the paper, which is moved back and forth at the same time as the piston in the cylinder, we will have a diagram which will show the exact pressure of the steam at every part of the stroke.

Col. Jones, at our last meeting, emphasized the necessity of having the pencil point press very lightly and evenly on the paper. In stationary practice this can be accomplished by a man with a steady hand and having a delicate sense of touch, but on a locomotive, with all its jolting, it is impossible to do this without a special device. You will note that there is a stop, against which the ārm carrying the pencil point strikes, and that by means of a screw the pencil point can be adjusted so as to just touch the paper. However, the pencil point wears off after a few cards are taken and requires readjusting, and it is impossible to do this with any degree of delicacy while the locomotive is

in motion. Where long runs are to be made, with infrequent stops, I have used a brass point with metallic paper to good advantage. The brass point wears very much more slowly than the pencil point.

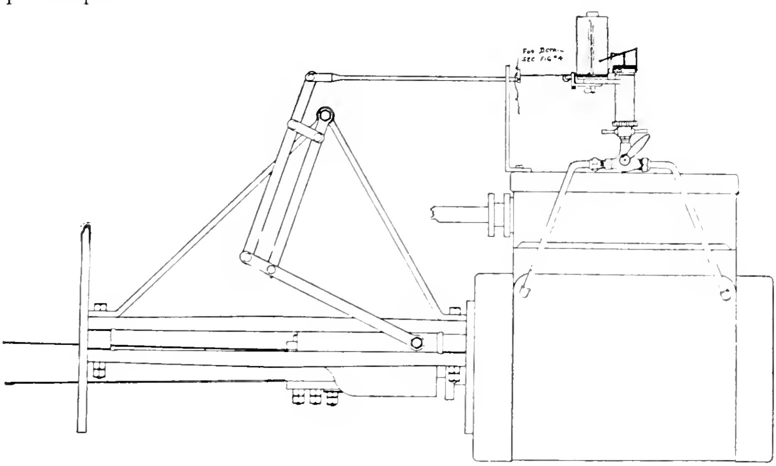


Fig. No. 3.

APPLICATION OF INDICATOR TO LOCOMOTIVE.

Fig. No. 3 shows the application of the indicator to the locomotive. Since the stroke of an engine is usually from one to three feet, and the indicator drum can only revolve a few inches, it is necessary to reduce the motion of the piston. There are several types of reducing rigging. The type shown is known as the Pantograph Reducing motion. To give good results at high speed the bearings should be good and large and should be well lubricated. The brace carrying the rigging should be stiff and well fastened, so that there will be no vibration. Any lost motion or vibration in the rigging will tend to distort the diagram.

The cylinder of the engine is tapped out near the end, as shown, so that the hole will come inside the clearance space, and is connected to the indicator by means of a half-inch pipe. It is important that the pipe should be as short as possible, and for this reason it is advisable that the indicator be placed alongside the steam chest, instead of on top of it, if it is possible to do so.

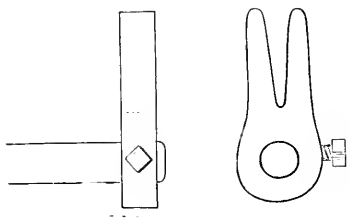


Fig. No. 4.

DETAIL OF STOP AND START MOTION.

One of the more recent improvements in the indicator is an arrangement whereby the drum can be stopped from revolving and a new card put on it without disconnecting the cord connectnecting it to the reducing rigging. As yet, however, there are comparatively few of these in service. Fig. No. 4 shows a detail of a device which I have found to give splendid results for connecting and disconnecting the cord. I believe the idea was originally suggested by a student at Purdue University, and it is described by Prof. Breckenridge in a paper he read before the Western Railway Club.

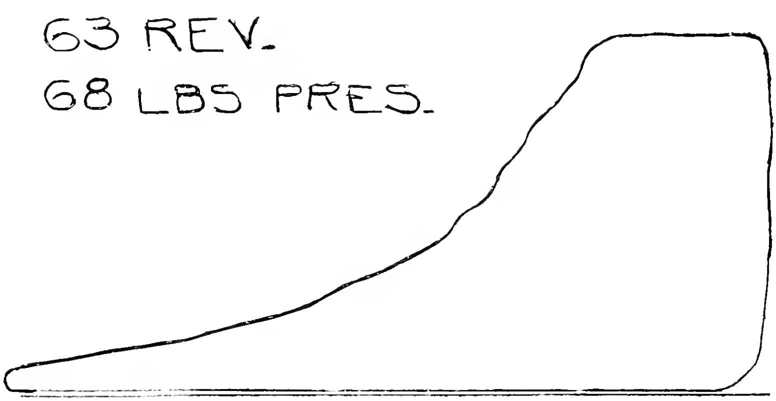


Fig. No. 5.

CORLISS ENGINE DIAGRAM.

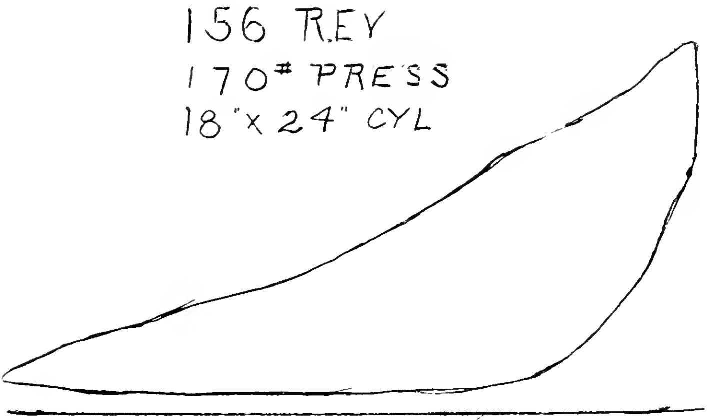


Fig. No. 6.

PASSENGER LOCOMOTIVE DIAGRAM.

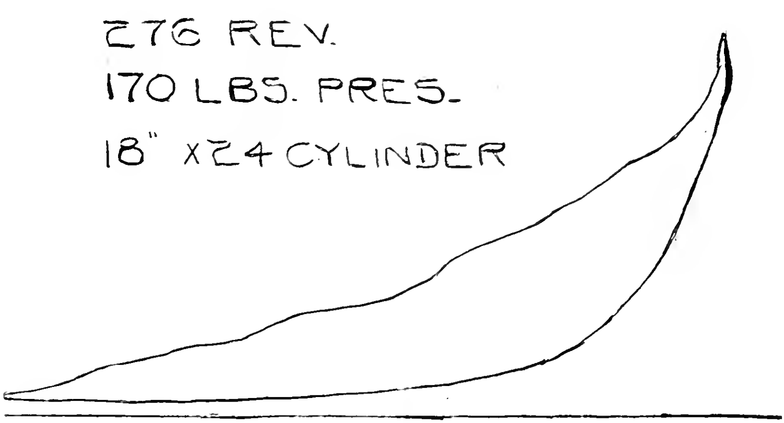


Fig. No. 7.

PASSENGER LOCOMOTIVE DIAGRAM.

Fig. No. 5 shows a Corliss engine indicator card. It is a fairly good specimen. Figures No. 6 and No. 7 are representative diagrams from a simple passenger engine. On a locomotive the cut off is changed by changing the travel of the valve, and at the same time that a change in the cut off is made all the other parts of the stroke are affected. With the Corliss engine, how-

ever, there are four valves controlling the opening and closing of the steam and exhaust ports, and if the steam valve is changed it does not affect the exhaust valves. It is therefore possible to get a better and more economical distribution of steam in the Corliss engine. The valve on the locomotive does not open up full or close on the instant, but the change is progressive: For this reason the points of admission, cut off, etc., are not as sharply defined. Then again, with the valve traveling at a high rate of speed, the port is open only for an instant and not much steam can rush in, and the card therefore shows a wire drawing effect which would not appear at a slow speed. The straight line below the card shows the atmospheric pressure, and it will be noticed that the back pressure in the locomotive cylinder is much greater than in that of the Corliss. This is because of the necessarily small exhaust ports and passages, etc.

In reference to the paper read at the last meeting on "The Indicator in Locomotive Practice," there are several gentlemen present who have had more or less experience with the indicator, and I am sure a good discussion of the subject will be profitable to us all.

President:—Gentlemen, this question is open for discussion.

Mr. Ira C. Hubbell:—As I said not long since in a Western Railway Club meeting, one of the criticisms which I had heard quite often with regard to Mr. W. J. Bryan was to the effect that he was a very fluid talker; that he spoke without preparation. In that respect, perhaps, he and I are alike. The subject under discussion is one of the small questions of gigantic proportions. The perfection of the stationary engine is unquestionably due largely to the unlimited use of the steam engine indicator. It is very much easier in the test room of any manufacturing plant manufacturing stationary engines to cover in a ten hours' run a wider range of experiences than you could get in locomotive practice in ten months, for the simple fact that in stationary practice you can easily arrange your conditions with a series of valves and friction brake for any purpose to be developed, and you can change conditions in the length of time you can open one valve and close another and change your brake relations. You can't do that with a locomotive. In December, 1900, I presented a paper before the Western Railway Club of Chicago, and in which was introduced a series of indicator cards which had been taken from a stationary engine, in which the cylinder clearance had been

arbitrarily reduced in order that the indicator cards might forcibly illustrate the effect. At that meeting, a gentleman connected with one of the Western railway lines made the remark that it had been so long since he had seen an indicator applied to a locomotive on his road that he probably would not recognize an indicator if he met one walking down street. In the experience that I have had in the past eighteen months, I am convinced that there is nothing that railways can do that will produce more dollars for cost of investment than a careful and wise use of the indicator in connection with their locomotives. This work must not be done superficially. It must be done thoroughly and practically.

Manufacturers of steam engine indicators, I think, make the same mistake that manufacturers of other articles fall into in giving advice as to what should be used for the work. It is essential, and that word "*essential*" wants to be in very large capital letters, that you should avoid all possible errors in your work, therefore the moving parts of the indicator necessarily need to be as light as conditions will permit. The manufacturers of the indicators frequently recommend to railroads that for locomotive use they use the indicator with what is known as the small drum, because that is a fraction lighter, and has less momentum. I have found in my experience that the small drum on the locomotive is a serious mistake. We see published in our papers frequently indicator cards taken from locomotives on various lines, but the cards are very short, very small, and it is practically impossible to get from such diagrams the information you need in order to have the work you have gone through of any practical value. I have taken many cards within the past few months, all of which are three and one-half inches in length. I think I made one mistake in that work in using a No. 120 spring, instead of using a No. 100 spring. Had I used a lighter spring, the diagram would be relatively higher, and would reveal more readily the inaccuracies in the steam distribution that you seek to have disclosed by the indicator diagram. Therefore I want to leave the thought with you who are here, that in taking up this work you will get the best results with the size of drum on the indicator which Mr. Wright has shown us, and which is the standard size of drum, and you can then get cards four inches long. It will not then be necessary to get the string adjusted to such a degree of nicety as must be done with the smaller drum.

The reducing motion is of the utmost importance in this work. Mr. Wright has pointed out defects in the reducing motion he used; and if you get any vibration in the reducing motion in any way it simply spoils your record, and your diagram then becomes largely a matter of guess work, and shows you only imperfectly the grosser errors, if any, in the steam distribution.

A correct reducing motion is an actual necessity, and one of the best mechanisms that I have seen anywhere is one used by the Pittsburgh, Fort Wayne and Chicago railway, and I presume a similar reducing motion is used by other lines on the Pennsylvania system, but I have my information from the Fort Wayne. It is an actually correct movement. It costs some money to get it up, but it is a good investment. Write to Mr. Crawford and get a copy of their blue print.

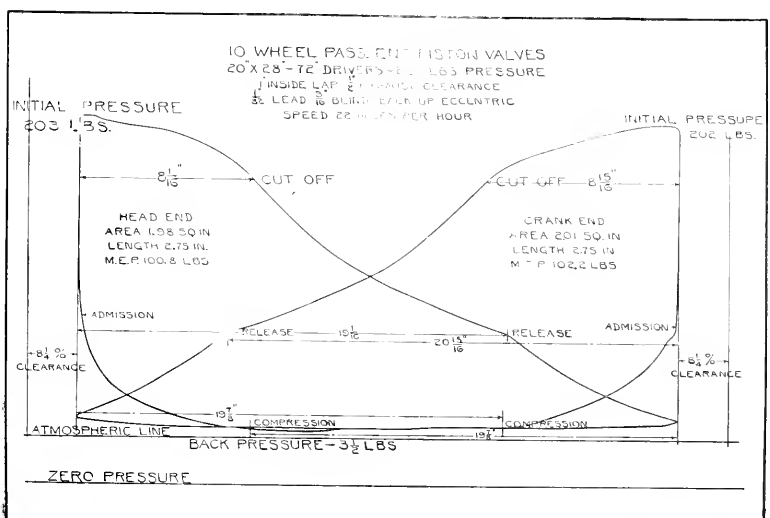
In this work avoid taking anything for granted. There is always a cause for the lines in your diagrams. It doesn't necessarily follow that it is some inaccuracy in the indicator or the reducing motion. As you get your diagrams, study them and find out. For instance, in the diagram before us from the Corliss engine you will notice a certain irregular, wavy line in the expansion line. It is possible, and probable, that that results from some dirt in the cylinder of the indicator, producing an abnormal friction, so that the indicator spring, in returning the piston home to its normal position, does so by jumps. If that is so, the steam line is probably not exactly correct. It is easy, comparatively, as we are working with the indicator to stop and correct these matters. There is always a cause for the effect. Not long since there was published in one of our trade papers a series of diagrams from the locomotive. The editor in chief had taken the diagrams. The account commented favorably upon the steam distribution of the locomotive. I wrote the Superintendent of machinery of the line, and asked him for half a dozen of the original cards, and in reviewing the original cards as he sent them, I asked him if he would not improve the first opportunity he had to examine the condition of the locomotive, as one of three things was true: Either his eccentrics needed attention, the holes for the indicator were not tapped through the cylinder, or the piston partially covered the holes for the indicator connection on the engine's cylinder. I received a letter in answer, saying that the holes were imperfectly tapped, and consequently the diagrams taken were of no value whatever.

Study each point carefully and thoroughly. You can adopt many easy methods for keeping the connections between the reducing motion and the indicator. In preparing your locomotive for this work you want, in order to protect your operator, to construct a substantial platform in front, and one of the best things I have seen in this respect, by the way, is one used by the C., B. & Q. road, I think in running at a high rate of speed, if you came across an animal that got where it did not belong, that that platform possesses sufficient "bucking qualities" to take care of the animal. This platform is easily changed from one engine to another. Mr. Deems, of the C., B. & Q., I am sure will be glad to give any of you information on this subject. Gentlemen, do not pass this subject lightly by, because this is a day when we are in a progressive age, and there is nothing that will give greater revenue for the money invested than the time and money needed to properly do this work. The application of the indicator to the locomotive is of inestimable value; it gives one hundred cents in value for every one dollar.

President:—We have with us to-day Mr. Dreyfus, Motive Power Inspector of the Pan Handle system of the Pennsylvania lines. He has had considerable experience in indicator work. and we would be glad to hear from him.

Mr. Dreyfus:—Mr. President and Gentlemen: We have been doing considerable work in this line, and I shall endeavor to lay before the Club some of our results, which I hope will be of interest and benefit to its members. We use a pantograph reducing motion, similar to the one just described by Mr. Wright, differing, however, in that we use case hardened thimbles at all bearings, thereby reducing wear or lost motion to a minimum, and in that the fulcrum is supported by a cast iron bracket, which fits over top bar of guide, being held in place by two set screws and the guide oil-cup. We have also used a double slotted lever reducing motion and same has given good results. We are now indicating a Vauclain four cylinder compound, and in order that we may obtain diagrams from both ends of high and low pressure cylinders with the use of only one indicator, it was found convenient to use a special five-way cock, a blue print of which I will gladly pass around. In order to secure tighteners in all the pipe joints, the wrought iron was replaced by $\frac{3}{4}''$ copper pipe and a ball and ring joint used. By using a plain straight-

way cock between three and five-way cock and the indicator, a true atmospheric line was obtained. The indicator has been of great value to us, and has been instrumental in pointing out seve·al defects in the valve and valve gear. The valves of the engine in question were very carefully gone over, two or three times, and supposed to be square, or as nearly so as could be obtained by means of trams, but on being placed in service and the indicator applied, the valves were found to be out; furthermore, the indicator cards will also tell whether your cylinders are being properly oiled or not. I will pass around for observation several cards showing the effect of insufficient lubrication. You will notice that area representing the work done, of the head end, is very much reduced. By increasing the supply of oil from five to fifteen drops per minute, the diagrams again become normal. By means of the indicator we were able to detect a springing in the valve gear, and this trouble was overcome by substituting an intermediate blade or motion bar of I Beam section for one of a rectangular and smaller section.



Herewith is an indicator diagram enlarged six times, it being taken from a 20x28, 72″ drivers, 10 wheel passenger engine, 225 lbs. boiler pressure, at 22 miles per hour. The engine is equipped with inside admission piston valves having inside lap

1″, and ⅛″ exhaust clearance. The valve was set $\frac{1}{32}$ lead full gear and $\frac{3}{16}$ blind in back-up motion. This card shows very conspicuously the four events of the stroke, and may be considered an ideal card for the speed, showing almost equality between areas, and cut offs for the two ends, and shows only 3½ lbs. average back pressure. This card was taken when assisting a freight train over a 1% grade.

President.—Are there any gentlemen present who wish to ask Mr. Dreyfus any questions?

Mr. Hubbell:—I want to say just one word more in reference to this work. In Mr. Dreyfus' remarks he spoke of springing valve movement. Your work, no matter how thoroughly done, in setting the valve for the trams, is at best not absolutely accurate. Your indicator card reveals certain things which are taking place. After you have gone over your card the valve movement is set.

Mr. Turner:—I understand, Mr. President, you have considerable experience in indicator work. May we not hear from you?

President:—I would like to know at what point that engine was cutting off at when that card was taken.

Mr. Dreyfus:—As it was only a preliminary run, there were no observations being made in the cab, consequently I do not know the exact point of cut-off, but I should judge from card to be about 10″.

President:—How do you account for so little back pressure, only 3½ pounds?

Mr. Dreyfus:—The valve having somewhat of an early release (⅛″ exhaust clearance), and the moderately slow speed when card was taken, both have a tendency to reduce the back pressure.

President;—What was travel of valve, Mr. Dreyfus?

Mr. Dreyfus—Five and $\frac{5}{16}$.

President:—There is one thing I should like to speak of on Mr. Wright's paper. He says, "Who ever heard of a locomotive builder applying an indicator to a locomotive before it leaves the works, unless it was particularly specified, and how many times is it specified?" I do not know of an instance where it has been specified that it should be indicated before leaving the locomotive builder's works. It is almost impossible to do it. Some

locomotive works have no place to test their engines. About all they can do in that direction is to raise the engine from the floor and run the engine under steam for a short time to see if everything is working all right. In other places they may run it around the yard and get a movement of two or three hundred yards for two or three hours, when the engine is prepared for shipment. An indicator card taken under such conditions would not show anything of value. The run would be short and such a small quantity of steam used that a very unsatisfactory card would be made. The probability is that you would not get a card. The engine would be working under a light throttle, and at the same time it might raise the water, which would go through the indicator and thus destroy the card. Unless they had the opportunity of putting the engine on a train and testing it under road conditions, I do not see how such a card from a new engine would amount to anything.

The indicator tells some queer things when you are working out the horse power of a locomotive. In starting a train from a station, it is sometimes necessary to work the engine at full stroke. At four miles an hour, it would indicate probably 500 H. P. After your train is under motion and your speed increases, as you begin to pull the reverse lever back, cutting off shorter, you are using less steam. Should you get your train going at a speed of sixty miles an hour, with the engine cutting off at six inches, you then figure the horse power, and it will tell you you were developing from 1,200 to 1;300 H. P. When you are running at a low rate of speed, the indicator shows the horse power to be low. As your speed increases and your piston travel is greater; while at the same time you are using less steam the indicated horse power increases. Is that not right, Mr. Hubbel?

Mr. Hubbel :—Yes, sir.

President :—I should like to call your attention to the atmospheric line on this card. The higher the rate of speed the greater the back pressure. This is occasioned by the compression in the cylinder. An engine with a high nozzle will show more back pressure in the cylinder than one with a low nozzle. The shorter the exhaust pipe, the larger you can make the nozzle opening.

The indicator is one of the best investments a railroad company could make. If they were in general use on all railroads, it would be the means of producing better working engines ; also

freer steamers, and engines that would use less fuel and haul more tonnage. As a rule, if an engine is square it is considered all right. If you put the indicator on it might show a large back pressure, and back pressure means a large fuel consumption.

Mr. F. T. Hyndman :—Has anyone ever kept a record of cost of applying and taking a series of cards?

President :—Possibly Mr. Dreyfuss would give us some information on that subject?

Mr. Dreyfuss :—I am sorry, but I cannot.

Mr. Hubbell :—I can make a guess at it. Take such a platform as the C., B. & Q. use, and for a reducing motion such as used by the P., F. W. & C. Ry., the expense of getting up those two outfits would be somewhere in the neighborhood of $175. Two indicators will cost $100. Your expense beyond that is the services of those whom you engage in the work. You want at least a man for each side of the engine in order to do the work and do it correctly, and one man in the cab. The trip usually comprises a day. It probably would take a great portion of another day to arrive at the result, and from what I have said you can arrive at the approximate cost. I want to say on the lines of what our President said with reference to locomotive builders testing locomotives. It would be practically impossible to conduct a series of tests in a locomotive plant, such as we do with stationary engines before shipment.

President :—Mr. Turner, can you not enlighten us on this subject?

Mr. Turner: I am one of the unfortunates who know very little on this subject. I freely make this confession, but feel, at the same time, that there are several more of us here in the same boat.

Steel Tired Wheels Under Freight Cars.

BY JOHN S. FRANCIS, M. E.

The old maxim that a child must creep before walking is no joke. The first wheels under rolling stock were wood, similar to the wooden rail, the next improvement was the cast metal

wheel and rail. The wrought metal rail soon demonstrated its superiority. Therefore it seems strange in this advancing age that cast metal should predominate in wheels under car tenders and front ends of locomotives.

Every once in a while we hear press reports of a serious wreck, caused by broken wheels, and now if we keep our ears to the ground we hear the rumbling that the cast wheels are giving out under steel cars, especially in the iron ore trade, the manufacturers are defending them on the ground of improper construction of the truck, which must be admitted is partly true. This, however, we shall not at this time discuss.

Large companies are composed of several departments. To meet with success it is essential that all should work in harmony. Under heavy cars, the wheels of excessive weight act as steam hammers on the rail joints, switches and frogs. More so is this the case on branch roads having light rails, ties and little or no ballast.

The weight of wheels could further be reduced by reducing the weight of the axle, which is increased in size, not that it is necessary to increase strength as much as to increase the journal bearing. While enlarging the axle, the weight could be reduced proportionately by boring out the center, which, if anything, gives a stronger axle than the solid. This form of axle, with plate wheel, will be recognized as a better distribution of metal.

Any change from the present will, I fear, be frowned down by the cry of excessive cost, similar to air brakes, automatic couplers and other improvements on freight equipment. The first cost is at present high, it is true, but is commensurate with service rendered. But if the manufacturers are guaranteed sufficient orders they can reduce the cost of wrought metal tired wheels to within 25 per cent. of cast. While revising this article, your humble servant ran across an article in the technical press on the present status of the cast wheel. The writer admits that the cast wheel gives satisfaction under 60,000 pound capacity cars, says in part: "It is probably safe to say that a good wheel for 100,000 pound capacity cars can be made of cast iron, though it may be that its cost will be so great that it will not be economical as compared with the steel or steel tired wheel. This is apparently held by two or more concerns that are planning

extensive shops and expensive machinery for the manufacture of solid steel wheels for cars of high capacity.

The freight equipment has ever been the Cinderella, while the dainty crumbs are given the passenger and locomotive department. "Oh, anything is good enough for freight cars," is an expression heard on every side, and is in some minds a deep rooted conviction, this in view of the fact that from 75 to 90 per cent. of the revenue is from freight. It is therefore easy to perceive what is good enough for passenger is none too good for freight.

The value of steel tired wheels is cumulative; they can be turned to a true diameter, and both wheels on the same axle of the same caliper. The contraction of cast wheels is in most cases unequal; one wheel on the same axle may be from 1/8 inch to 1/4 inch larger or smaller than the other. In other cases the wheel may not be of a true diameter, being oblong. These deficiencies cause one wheel to cut ahead, while the other cuts back. This may seem trivial with one truck, but considerable in the aggregate of a whole train, which means loss of motive power or dead resistance.

The manufacturer is often hauled over the coals for furnishing wheels that do not prove up to the standard or run the guaranteed mileage. Often he is more sinned against than sinning. He does not or cannot vouch for the equal shrinkage. The diameter of the tread cannot be equal unless the wheel is milled down on the axle, which goes to increase the cost approximately towards the wrought metal wheel, to say nothing of the chances of affecting chill on the tread. It is apparent, I trust, why cast wheels (not milled) wear out, also entailing a corresponding wear on the rails. Also the sprocket braces have a tendency to fan up the dust, which adds grief to journals.

Power brakes have put cast wheels "on their metal." One road some fifteen years ago would not permit cast tread wheels to run on fast trains controlled by air, due to having several failures on heavy mountain grades. With increasing heavy loads, the conviction is growing that cast tread wheels are getting that "tired feeling."

President :—I wish to say, gentlemen, that this paper is not open for discussion, but if anyone wants to ask Mr. Francis any questions, I have no doubt he will be glad to answer them.

A member:—As I understand the Master Car Builders' rules, any such difference as Mr. Francis states is impossible. On what experience is that statement based?

Mr. Francis:—Seeing wheels milled down one side, when they would probably take off 1/8 inch before the other side is touched. Such wheels have been put on the cars without being milled. Where there are two wheels of different diameter, in other words, in the shop, they are liable to get them mixed. Now, it is impossible to insure the same shrinkage. The wheels are bored and pressed on. Even if calipered, they may not be of a true circumference.

Mr. Slocum:—What roads have a practice of that kind?

Mr. Francis:—I cannot say that exactly.

Mr. Slocum:—Do you really know that there are roads that have a practice of this kind?

Mr. Francis:—No; only what I have seen from my own experience.

Mr. Slocum:—Are you aware of the system manufacturers of car wheels pursue in order to get their wheels of a uniform size?

Mr. Francis:—I am aware that they aim to come to it as nearly as possible. I am not aware of the system they adopt.

Mr. Slocum:—We have in Pittsburg two of the largest wheel foundries in the United States, and their system will not permit any such irregularity. So far as I am concerned, I would like to have Mr. Francis or anyone who wished to investigate the question, to come to our works and see whether we are up to date or not.

President:—I think there is some misunderstanding here. I believe Mr. Francis wishes to give the impression that one wheel was a quarter of an inch larger than the wheel on the opposite end of the axle. That is a reflection on shop practice. It is the general practice of manufacturers to tape their wheels. This measurement is made around the circumference with a metallic tape line, and the measurement is marked tape 1, 2, 3 or 4. A wheel with a higher chill would indicate a smaller tape measure than a wheel with a lower chill. Tape Nos. 1, 2, 3 and 4 may all come from the same heat, and when mated would be practi-

cally the same size, and a pair of calipers would indicate very little difference in the two wheels marked with the same tape number.

Mr. Francis:—Suppose the wheels are taped and are mixed up at the shop, what assurance have you of getting the mate of that wheel?

President:—If the wheel is taped so as to get the exact diameter, there should be no difficulty. Of course, if you take a tape No. 1 and put it on one end of the axle and a tape No. 4 on the other, you have two wheels of different sizes. Tape numbers should be mated together.

Are there any other questions you wish to ask Mr. Francis? This is going to be a very important question, and there should be a general discussion on this matter.

If there is no further business, a motion to adjourn will be in order.

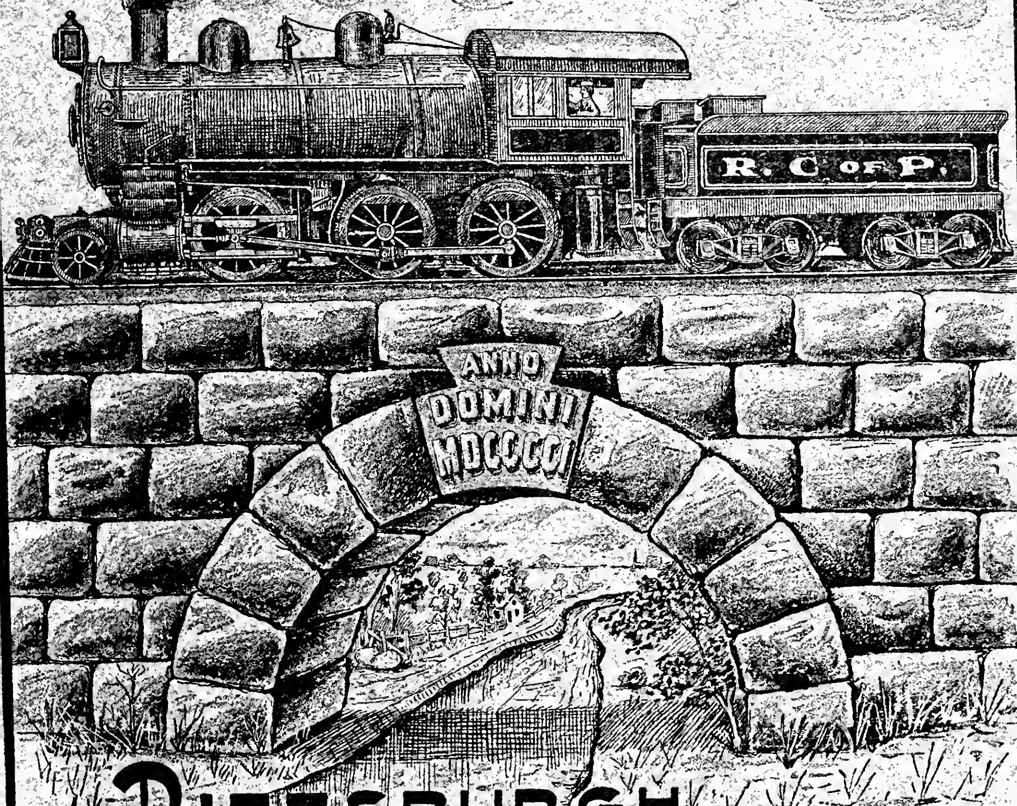
Upon motion, duly seconded, meeting adjourned.

RAILWAY CLUB

OF

PITTSBURGH.

OFFICIAL PROCEEDINGS.



PITTSBURGH,
PENNSYLVANIA.

FEBRUARY, 1902.

Classified Index of Advertisements

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OFFICIAL PROCEEDINGS

of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

OFFICERS, 1901 - 1902.

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Manager American Locomotive Co., Pittsburgh, Pa.

Vice-President,
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Supt Motive Power, P. & L. E. R. R. Pittsburgh, Pa.

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F. T. HYNDMAN,
S. M. P., Bflo, Roch. & Pgh. R. R. Co., Du Bois, Pa.

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, FEBRUARY 28, 1902.

The meeting was called to order at 2 o'clock P. M., at the Hotel Lincoln, with President J. H. McConnell in the chair:

The following gentlemen registered:

MEMBERS:

Anderson, Thos.,	McFeatters, F. R.,
Bole, Robt. A.,	McIlwain, J. D.,
Bowen, John R.,	McNary, James E.,
Brown, Raymond B.,	McNulty, F. M.,
Brown, John T.,	McTaggart, J. R.,
Buchanan, W. J.,	Redding, D. J.,
Carson, G. E.,	Rhodes, James D.,
Conway, J. D.,	Safford, J. B.,
Gearhart, H. J.,	Sweeley, G. P.,
Gilbert, E. B.,	Sherman, C. W.,
Haas, Ben.,	Sickle, Welling G.,
Hubbell, Ira C.,	Slocum, C. V.,
Hyndman, F. T.,	Slocum, A. W.,
Jones, Col. D. P.,	Stark, B. F.,
Kessler, D. D.,	Stovel, R. W.,
Loetscher, E. C.,	Turner, L. H.,
Mason, Stephen C.,	Watts, H. W.,
Mooney, E. P.,	Whitney, Louis B.,
McConnell, J. H.,	Wilson, J. T.,

Wright, R. V.,

VISITORS:

Carpenter, Frank,	McArthur, C. D.,
Lamb, Thomas,	Stott, A. J.,

President:—Gentlemen, it is about time to commence the order of business to-day, and as our minutes have been printed in the last number of the Journal, we will omit the reading and take up the question of the announcement of new members by the Secretary.

Secretary:—The following gentlemen have made application for membership to this club and their names have been approved by the Executive Committee:

Wm. Wright, Mec. Engr. McConway & Torley Co., 48th st. and Ally. Vy. Ry., Pittsburgh, Pa.

A. Turner, Rep. Galena Oil Co., 308 Western Union Bldg., Chicago, Ill.

W. T. Johnson, Rep. Crosby Steam Gauge and Valve Co., 78 John st., New York, N. Y.

C. H. Howard, V. P. and Gen'l Mang'r Leighton and Howard Steel Co., St. Louis, Mo.

Geo. B. Leighton, Pres't Leighton and Howard Steel Co., St. Louis, Mo.

John T. Keith, Sup't Lehigh Valley Ry. Co., Wilkesbarre, Pa.

F. M. Gilpin, Gen'l Sales Agt. Latrobe Steel Co., 1200 Girard Building, Philadelphia, Pa.

Ira H. Miller, Spl. Rep. Magnolia Metal Co., German Nat'l Bank Bldg., Pittsburgh, Pa.

Edwin F. Wendt, Asst. Engr. P. & L. E. R. R., General Offices, Pittsburgh, Pa.

C. W. Martin, Agent, Consolidated Car Heating Co., 634 Park Row Bldg., New York, N. Y.

H. T. Porter, Chief Engr. Bessemer & Lake Erie R. R. Co., Carnegie Bldg., Pittsburgh, Pa.

Geo. W. McCandless, Auditor McConway & Torley Co., 48th st. and A. Vy. Ry., Pittsburgh, Pa.

W. J. Buchanan, Asst. M. C. B. Bessemer & Lake Erie R. R. Co., Greenville, Pa.

President:—Mr. Secretary, have you any reports of committees?

Secretary:—There are no committees to report, Mr. President.

President:—Any communications?

Secretary:—Read a number of communications, among them the following:

Chicago, Jan. 22, 1902.

Mr. J. D. Conway,

Secretary Railway Club of Pittsburg,

Pittsburgh, Pa.

Dear Sir—A request has been made on the Arbitration Committee that a method of applying repair cards and defect cards to the steel underframes of freight equipment, be included in its report to the association at the next convention, and the Arbitration Committee would be glad, if in making up your suggestions, this matter receive your consideration.

Yours truly,

JOS. W. TAYLOR,

Secretary Master Car Builders Ass'n.

Secretary:—At our last meeting, Mr. President and gentlemen, we passed a resolution to the effect that we notify the railroad companies in the vicinity of Pittsburgh to have representatives present at this meeting to consider proposed changes in the M. C. B. Rules. Complying with this resolution, a circular letter was sent to the heads of the car departments. A number of replies have been received, giving names of parties who are to represent their respective companies; (reads letters).

President:—Under the head of "New Business" the question will now come up of the views of this club, of the changes necessary in the interchange rules of the Master Car Builders' Association. What has any member to offer on this subject?

A number of suggestions were offered by the representatives and members present, and, after the suggestions were discussed by the club, the following motion was offered by Mr. Ira C Hubbell:

That a committee, consisting of the chair, Mr. L. H. Turner and two other members to be appointed by the chair, receive the recommendations that have been offered to the club to-day, and formulate a report which shall be submitted to the arbitration committee of the M. C. B. Association, so that we will more clearly express the sense of the club as to the changes we may suggest.

President:—Suppose you put the motion in this shape, Mr. Hubbell: That the matter be referred to the Executive Committee of this club.

Mr. Hubbell:—I would amend my motion to that effect.

Motion carried.

President:—This now brings us, gentlemen, to the discussion of the paper presented at our last meeting by Mr. John S. Francis, "Steel Tired Wheels under Freight Cars." As Mr. Francis is present, we will ask him to open the discussion.

Mr. Francis:—I give all due credit, Mr. President, to the steel tired wheel people for what they have attained. A little case occured since the last meeting, which I think will fairly illustrate this matter of where a broken cast wheel under a tender. On examination of the track it was found there were 210 broken rails on the same side that the broken wheel was. I feel that I am justified in the belief that I am advocating a matter that is abreast of the times and is of absolute necessity.

A. W. Slocum:—I have read Mr. Francis' paper and will say I am not altogether in sympathy with his statements.

In the first place we are told that because at a time now past wrought iron was used for rails and cast iron at the present time is not the proper metal to use for wheels.

The matter of wrecks is a serious one, but did you ever stop to consider the small percentage of wrecks caused by broken wheels. You must remember that we have wrecks caused by other things than wheels, such as side wiping, trains parting due to overstrain, faulty couplers or knuckles, wrong or misunderstood signals, air brakes not working properly and many other common causes. Still, when a wreck occurs and a broken wheel is found, we hold up our hands in horror; but if due to anything else it is put down as an unaccountable accident. Do you give credit for the number of wrecks prevented by the use of good cast iron wheels? Look back in your memories, gentlemen, and give these wheels credit for the number of times you have seen cars off the track and wondered how it was possible the wheels withstood such treatment, and what

a smash up there would have been had one or more of them given away.

I am pleased to know that Mr. Francis gives the cast wheel some credit, wherein he says improper construction of trucks is causing trouble, and that the heavier wheels (which are the steel tired) act as steam hammers on the rail, joints, etc.

I do not care to question the statement that wrought metal-tired wheels can be produced within 25 per cent of cost of cast wheels, but to do this, on account of the steel-tired wheels being so much heavier, they will have to be sold at less than one cent per pound, which leaves food for thought as to what kind of material they will use. Mr. Francis' remark as to the variation in sizes of cast wheels on the same axle is a pretty hard rub on the practice of the railroad machine shops, as wheels, when received by them, are stencilled with their sizes. The actual difference between each size being ⅛" measured on the circumference of the wheel. As a matter of fact, cast wheels as mated in the regular shop practice of today, on an average do not vary more than 1-16" in their circumference. Again, when the cast wheel maker puts his stencil numbers of size on his wheels, he is doing no more or less than vouching for the actual shrinkage of his wheels.

I would like to ask what is going to be the result of milling wheels on axles if the axles are not absolutely perfect?

The most apparent, or, at least, the most acceptable reason to the wheel maker as to why cast-iron wheels wear out after five or ten years' service is that it gives them a chance to make some more. If they never wore out they would have to go out of business. As to power brakes putting cast wheels on their metal, I can do nothing better than quote Mr. Macbeth, M. C. B. of the N. Y. C. & H. R. R. R., who stated at a meeting of the Central Railway Club, at Buffalo, some months ago: That the use of air brakes had largely reduced the percentage of flat cast-iron wheels on the Vanderbilt system; which I think you will admit is much more pertinent than some individual case which happened fifteen years ago.

It takes a good long time for the cast-iron wheel to get "that tired feeling," but when it finally does get tired I can assure you it is not steel tyred.

Mr. Francis: I said the first rails were cast iron, and were finally substituted by wrought, when wrought was giving better service. Now, there is no gentleman here who will deny that a rolled wheel can be made lighter than a cast wheel. We cannot say where the loading of cars is coming to. Cars of 100,000 pounds capacity on an Illinois road were loaded thirty tons in excess of their capacity. The delivering road had to shovel out thirty tons on account of excessive weight.

Mr. C. V. Slocum: I have always been much interested in meetings of railway clubs, the discussions and evident desire to get at the facts. As Mr. Hubbell very tersely stated at the last meeting, there is "always a cause." You take up the question and discuss it, and when you have gotten through, all have a pretty fair understanding of it and it results to the benefit of all interested. I was very much pleased when I heard that we were to have an article on the subject of "steel-tired wheels in freight service," and thought we should be given some comparisons; for instance, as to the thickness of tires or as to results obtained, mileages, perhaps, but instead of this we have had a paper entitled "steel-tired wheels in freight service," in which steel-tired wheels are mentioned just twice, and one of those two times is a quotation.

To begin at the last of the article, the cast-iron wheel is credited with having "that tired feeling." That reminds me of a story: A boy went to school and missed all the questions in mental arithmetic. He eventually gathered himself together and asked the teacher if he might give her one. Consenting, he said: "My aunt went to the grocery store and bought twelve apples, one for each of the children at home, but in returning she lost one. How did she divide eleven apples among twelve children so that each should have an equal share?" She gave it up and he said, "Why she made apple sauce out of them." Now, gentlemen, Mr. Francis has made apple sauce of the entire car

wheel subject, and I trust his feelings will not be hurt if he receives a little sauce in return.

Concerning the question of applying different sized wheels on the same axle. A car wheel makes a little over 600 revolutions in a mile. Taking the standard circumference, as given by the Lake Shore & Michigan Southern Railroad, in their specifications, of 103 67-100 inches, a wheel will make 611 and a fraction revolutions in a mile. Now, if you apply a wheel one-fourth inch smaller on one side of the axle than on the other you will have to drag the wheel about twelve feet in one mile, or 600 feet in fifty miles. Now, if any one of you will undertake to drag a 600-pound wheel only one foot, to say nothing of 600 feet, you will get some idea of the amount of resistance involved and amount of additional motive power required in hauling a train equipped with wheels fitted up in this manner. Worse than all, you get a side thrust or slew when one wheel is one-fourth inch smaller than its mate, or forcing the flange at the back of one wheel against the rail and forcing the front of the flange on the other wheel against the other rail; then if the wheels strike an imperfect joint or frog or crossing you will find that your cast-iron wheel is strong and your train will probably be in the ditch.

There is not a wheel manufacturer in the United States but tapes or measures his wheels and stencils a corresponding tape mark on the outside plate of the wheel. If any shop foreman of any railroad puts wheels on axles regardless of the tape mark he ought to be discharged. A man has no right in the railroad business who takes men's lives in his hands in this reckless manner.

Mr. Francis speaks of oblong wheels. There was a time when such wheels were supposed to be made and railway specifications for car wheels stipulated that wheels must be tested by placing a true metallic ring around the tread of the wheel, but imperfect castings in this respect were so seldom found that this specification has become practically obsolete. We do not find it in the specifications of the B. & O. nor the Pennsylvania

nor the Lake Shore & Michigan Southern. I have brought these specifications with me that any who care to investigate may see that I am talking facts and not generalities.

Now, gentlemen, I want to give you a few words on the subject of cast-iron wheels as made today. I have here a blue print of the new 700-pound wheel, which I will ask to have placed on the wall that you may all see it. This wheel now has only been made by one or two foundries in the United States, and there is only one road buying over 650-pound wheels, and that road is the P. R. R.

President: The Union Pacific uses 750-pound wheels.

Mr. C. V. Slocum: Seven-hundred-and-fifty-pound wheels are not used here. The heaviest wheel that we have supplied to any one in 33" diameter is 700 pounds. You have increased the weight of your car from 60,000 pounds to 100,000 pounds, or about 70 per cent. With the 10,000 pounds overload permitted, you have increased it over 80 per cent. You have increased the strength of other parts of the car and truck, including the axle. The heaviest axle now weighs 822 pounds as the limit. This is an increase in a very few years of nearly 100 per cent. What has been done in this direction for the cast-iron wheels? The standard for a car carrying not over 60,000 pounds is the 600-pound wheel. This has been increased about 50 pounds for the 100,000-pound capacity car, or 8 per cent. You have, therefore, increased the load 70 to 80 per cent, the axle 70 to 100 per cent and your car wheel just 8 per cent, not 80 per cent, but plain, everyday 8; yet so far as we know the chilled iron wheel when made sufficiently heavy is giving absolute satisfaction. It is not a generally known fact that the cast-iron wheel is annealed and is, therefore, practically a malleable casting. It cannot be made oblong, and it must come out round.

To make a little comparison between the cast-iron and the steel-tired or steel wheel I have here a little booklet of the Latrobe Steel Works. Now, I have not one word of criticism to make about that company or their product. Every word they

state, so far as I know, is absolutely true and I have brought the booklet therefore, not to refute anything they say, but to substantiate my own statements. Latrobe gives in this book a table of weights of all steel-tired wheels which they manufacture. This book shows that the heaviest steel tire for a 33" wheel weighs 706 pounds. Not the steel-tired wheel with the center, but just the tire alone. Your steel-tired wheel, therefore, begins with a weight of tire where we finish with our wheel complete. Latrobe catalogue shows that their medium size, or 3½" thick, tire averages 593 pounds for 33" wheels. The medium size cast-iron wheel finished weighs from 590 to 600 pounds, and here again the weight of the medium cast-iron wheel complete only equals the weight of the tire for the medium-weight steel-tired wheel.

Mr. Francis states that two different plants are being built to make a wheel which will eclipse the cast-iron or chilled wheel, to wipe it out of existence, so to speak, and that if the manufacturers are given orders for as many wheels as they can make that they can bring the cost down to within 25 per cent of the cost of the cast-iron wheel. Now, we will not be outdone in generosity. If Mr. Francis, or any one else, will give us orders for all the wheels we can make for responsible parties we will throw off that 25 per cent and meet him on even terms.

Machine work, gentlemen, is expensive. Your machine work and centers alone cost as much as your cast-iron wheels, without saying one word about the cost of your tire, and this is not all. The different foundries throughout the country are experimenting every week, and generally every day of the week, in the use of new materials, special mixtures, etc., and it is demonstratable that the cast-iron wheel, with a very slight increase in its present cost, can be made to largely increase its present creditable mileage.

This little book of the Latrobe Steel Works states on page 9, that it is the American practice to take out the steel tire when the rim gets worn down to 1½ inches, yet the rim of the cast-iron wheel is only 1½ inches thick to begin with, and

where does the superiority come in of a wheel which must be taken out as unsafe when the lighter wheel can be put into service new at the same measurement and be actually safe for years. Your real difficulty is that your specifications to the car wheel manufacturers call for a wheel of a certain weight and certain projections and outlines, and if the wheel so ordered varies one-thirty-second of an inch in any particular the whole lot are likely to be rejected and the manufacturer not receive one penny for his pains.

As to the question of cost, the lowest quotation I have known of for some time is $38.00 for standard steel-tired wheels, 33" diameter, but call it $35.00. This 700 ℔ chilled iron wheel, guaranteed for five years, is being sold today for less than $10.00, so that in brief the situation is as follows: You have increased the weight of the car, as previously explained, 70 to 80 per cent, the axle 70 to 100 per cent, the wheel 8 per cent, and yet the wheel does the service at a cost of $10.00, as compared with $35.00. Further than this, the manufacturer of cast wheels takes an old wheel in part payment for a new one and the differential is only about $3.00.

In conclusion, gentlemen, the day may come when the race will be between the cast-iron wheel and the rolled steel or steel-tired wheel, but that, I believe, to be in the far distant future. We must not forget that Mr. Francis has named a child that is yet unborn, and that is not always a safe practice—little Willie may turn out to be Mary Ann—but if the day does come and these two racers are waiting for the word or the pistol shot, don't bet all your money on the green horse; put a little of it on the old campaigner.

Secretary: I have an article which has been contributed, the writer not being present. If it is the pleasure of the members present I will read it. It is by Mr. Frank A. Wheeler, and bears on the subject under discussion.

Contributed—Car Wheels—A most serious problem in the railway world of today.

The cast-iron, chilled car wheel, so universally used on American railroads, is rapidly showing signs of failure to

longer bear up under the enormously increased weight and speed of both freight and passenger cars.

It is giving way, especially at the "throat" of the flange at the fillet or base of same, where it joins the metal of the tread of the wheel.

The metal at this point is subjected to more varying strains than any other part of the wheel, and as a consequence frequent failures occur, due to the decrepitation, crumbling or "shelling out" of the metal, causing the flange to break off.

The heavy blows the flanges of car wheels are subjected to when a train is surging round a curve, to say nothing of blows sustained in striking the point of a frog or switch, is the subject of great concern among railroad motive power officials. While it is generally admitted that the initial hardness of the chilled surface of a cast-iron wheel is difficult to obtain in a steel tread and flange, yet it is also admitted that some remedy must be applied for the lack of strength in the cast-iron wheel flange to withstand the blows aforesaid.

A substitute for the chilled cast-iron wheel has been in use for twenty-five years or more in the shape of various types of "steel-tired" or "built-up" wheels.

These wheels have a rim or tire of steel, shrunk or fastened onto a wheel center of cast iron or cast steel.

The makers of such wheels have fought for years for their introduction on American railroads, to supplant the common cast-iron article, but with little success, comparatively, and owing chiefly to the great first cost and also the cost of repairs.

The claim for safety made by the manufacturers of these wheels has not been borne out by the experience of a number of railroads. Many instances of the tires becoming loosened by the heating caused by the break-shoes in descending grades are a matter of official record.

In such cases it usually happens that the so-called retaining-rings, or fasteners for the tires should they become loose, have absolutely failed of their functions, and the wheel has gone to pieces, the result of which would be as bad as that of the

breaking of the flanges of a cast-iron wheel, and would be liable to wreck any train.

Many a train has undoubtedly been wrecked from these causes, but attributed to other causes, for, in the mass of broken wheels, who can say that it was any particular broken wheel that caused it?

Railroad officials say that a substitute for both the aforesaid types of wheels is urgently needed—one that will combine the greatest factor of safety, with good wear and as low a cost as possible. The factor of safety is all-important.

Bearing upon this subject and as showing the want that is felt for a better all-round car wheel, the following quotations and references are appended:

From the report of a committee on "Relative Merits of Cast-Iron and Steel-Tired Wheels for Locomotive and Passenger Car Equipment" to the convention of American Railway Master Mechanics' Association for 1899:

"It should be remembered that the item of wheel service is the most expensive single item with which we have to contend."

"If it has been demonstrated that steel-tired wheels are safer than cast-iron wheels, railroads cannot afford to ignore this fact, and are without excuse for accidents arising from breakages, at least under passenger cars and locomotives, if the same are caused by breakages of cast-iron wheels, no matter what the difference in cost may be."

"Steel-tired wheels are safer than cast-iron wheels; otherwise the relative merits are about the same."

See reports of the same committee for the years 1900 and 1901. From that of 1901 is the following:

"Since the last report of this committee, the question has been raised as to the expediency of the use of steel-tired wheels under 100,000-pound cars."

From the report of Committee on Cast-Iron Wheels to the Convention of Master Car Builders' Association for 1901:

Mr. Garstang recognized the inferiority of wheel metal and thought that two pounds of poor metal were better than one

pound. Mr. Hennessy made an eloquent appeal for better material. If wheels burst in forcing axles in place, the remedy was better metal rather than more metal.

"Contrary to expectation, it is not the truck or the axle that has manifested distress, BUT THE WHEEL.

Heavier wheels have been introduced without any improvement being effected. Those who have given the subject close study do not believe that even steel-tired wheels will carry the weight with safety (referring to 100,000-pound cars).

See "The Foundry" for June, 1901, page 171, for an article on "Present and Future Chilled Cast-Iron Wheels."

From the foregoing it will be seen that there is grave doubt and uncertainty in the car wheel world. This well-recognized demand for something better can be met completely by a solid integral forged and rolled steel wheel, as contemplated by the Wheeler process or system of wheel manufacture, as invented by the writer. This method, briefly outlined, is to make a wheel of one piece of steel of accepted standard quality, with a suitable hardening agent thoroughly incorporated with it in the melting furnace. This unit of metal is then forged under a powerful press or hammer into a blank, the hub of which is black-forged to size, with the web or plate and rim left considerably smaller in diameter than they will be in the finished wheel.

This wheel blank is then rolled, or spun out, on a specially designed machine, to finished diameter, the web or plate being rolled down to such thickness as may be desired, the general form of wheel being that of a disc, which is the strongest form of wheel center. After rolling, the wheel is suitably annealed, and the tread tempered if desired to get extra hardness. During the heating for rolling the blank is so treated in the furnace to the end that the finished forged hub be not heated to a scaling or working heat for various reasons—the rims and outer portions of the plate only, being so heated that they may be rolled at a low heat.

By this process all shrinkage strains are eliminated.

This ideal wheel is not to be confounded with the many prior attempts to make a "steel wheel" in one piece.

All of such wheels were steel castings or forgings, without rolling or work done on the tread or flange where all wear is; some castings were slightly smoothed up on the tread and flange to close up the numerous blow-holes and seams, but many were simon-pure steel castings with no forging or rolling whatever.

Such wheels, of course, failed in service both by breaking due to internal strains set up in cooling, and to poor tread and flange wear.

In the Wheeler process or system it is contemplated to give the rim portion of the wheel as much if not more forging and rolling than is given the steel tire used on the steel-tired wheels on the market today. By the use of certain hardening agents and suitably tempering, it is confidently expected to put out a better article as to tread and flange wear than is given by the steel-tired wheel.

The advantage of an integral wheel over one that is composed of from two to a dozen parts is apparent. The price of cast-iron 33" wheels at present is about $8.00 each, and of steel-tired wheels of the cheapest make, $45.00. The life of the former averages but 30,000 miles under 100,000-pound cars, and the cost per 1,000 miles is about 20 cents. The life of the latter wheel averages 180,000 miles, and the cost per 1,000 miles is about 35 cents. The life of the Wheeler rolled steel wheel is estimated to be 50 per cent greater than the steel-tired; but supposing it to be no better, its cost per thousand miles will be about 20 cents, the same as the chilled iron wheel, although its first cost will be about three times as much. In figuring these costs, interest on the investment at 6 per cent has been a factor. It is estimated that one rolled steel wheel will last as long as eight cast-iron wheels at 30,000 miles each; six at 40,000 miles; and four at 60,000 miles.

The cost being the same, or practically so, the rolled wheel has the great advantage of being the safer wheel by long odds.

A new rolled steel wheel can be sold for less than the cost of retiring a steel-tired wheel of the same diameter.

Thus it will not pay to keep up expensive machinery to re-tire old steel-tired wheels when a new wheel can be bought for less than the cost of re-tiring.

A number of engineers have reported favorably as to the feasibility of the "Wheeler Process," and it is expected to have wheels on the market in about a year.

It is a matter of record that, recently numerous 80,000-pound capacity gondola steel cars have had to be partly unloaded en route owing to failure of the chilled iron wheels under them.

Thanking the President and members of the Railway Club of Pittsburg for the courtesy extended me of joining in this discussion, I am, Very truly theirs,

FRANK A. WHEELER.

Pittsburg, Pa., February, 1902.

Mr. C. V. Slocum: The statement is made that the axle will give out first, which is interesting. As already explained, the weight of the axle has been increased 100 per cent, and has apparently had the desired effect in increase in the strength of the axle. You have increased the weight of the cast-iron wheel 8 per cent. This is something, but it is not to be compared with 100 per cent. I made a challenge a year or two ago in the Railway Gazette to equip a train with cast-iron wheels of our design in competition with a like number of steel-tired wheels and present them to the company making the test if our wheels do not make more mileage than the steel-tired wheels, cost considered.

Seven hundred pounds is not the limit of weight at which cast-iron wheels can be made, but the limit permitted by most roads is 650 pounds, with 2 per cent variation allowed.

One point which we did not touch upon this afternoon, which I consider very pertinent, is the question of longitudinal seams. There is no defect which has caused so much discussion as this one. Experiments which we have made demonstrate

that the longitudinal seam is caused by brake burning, and is only troublesome on mountainous roads or heavy grades. Very few, if any, roads with level grades have any trouble from this cause, but the longitudinal seam is not found alone in the chilled iron wheel; it causes just as much trouble in the steel-tired wheel and, if in the steel tire, it will appear in the rolled steel wheel.

The chilled iron wheel is in use under more than 95 per cent of the freight cars of the United States, and under the passenger cars as well. The Superintendent of one of the large roads of this city told me recently that they had quite as much trouble with the steel-tired wheels and expense in making repairs as they had with the cast iron. Of course, I am in the cast-iron wheel business and have summarized the whole thing from that standpoint. Now, gentlemen, one of the things you have to consider in using steel-tired wheels or wheels of any description, is the advance in the cost of at least $30.00 per wheel. Your little cast iron wheel (illustration) weighing 700 pounds, guaranteed for five years, sells for $10.00, and the conservative manager will think twice before he runs his cost up nearly to $40.00 per wheel.

Mr. Francis: I don't wish to kick up the dust in order to divert the attention from the main issue. The gentleman says that the axle has been increased 70 per cent, if he will refer to the article where it says that the axle was increased not for strength but to increase the journal bearing. Would you recommend a cast tire under a locomotive driving wheel?

President: It was the practice one time to put cast tires on locomotives.

Mr. Francis: The first cast wheel center was invented by Mr. Rodgers, of Patterson, using a wrought tire. There has been a good deal said about mileage, but when wheels need renewal the cars have to be switched to the repair yard. One of the aggravating results of the late congestion was the yards were blocked up with broken cars. The cost of switching it and getting it to the repair yards is more than the actual cost of

the wheels. My object is to get equipment to keep cars on the road instead of in the repair yard.

Mr. Ira C. Hubbell: Mr. Slocum stated something which was very dear to my heart when I was in the railway service, and that is the matter of specifications. I felt it was hardly a fair proposition for me to go to the cast-iron wheel maker and say that a wheel must weigh so and so; it must not weigh over so much; stand a thermal test, physical test, etc., and make 70,000 miles or give five years' service. It always seemed to me that we put him in an unjust position. I have watched with interest the discussion going on in our railway papers in regard to cast-iron wheels.

In 1881 to 1883 I was connected with the Denver & Rio Grande Railway. When trains crossed Marshall Pass, which had a grade averaging 224 feet to the mile, 25 miles long in each direction, I have seen cast-iron wheels come down that grade redhot and plunge into the snow banks, and to the surprise of everyone they did not fly into pieces.

I believe if the railways and the car wheel people will meet on the ground of mutual good I am convinced that great good will be accomplished, and no one would make the offer that Mr. Slocum has made today except honest in his purposes. I assure you, if in the railway service and I had anything to do with the proposition, I would meet Mr. Slocum half way and have him make some of those wheels. I would find out what there is in it.

Apparently from Mr. Francis' paper he has something "up his sleeve" that he has not shaken down, and I would like to ask that he close this discussion and let us have the facts on which he bases his paper and for which we are all obliged to him.

Mr. Francis: The Ashtabula bridge disaster was caused by a combination of cast and wrought metal, the cast angle blocks giving away. The result is known to all, and they have a private burying ground down there now. Now, as to steel-tired wheels being used on locomotive drivers. They are used because they

stand the pressure, and it is the only reason they should be used on heavy cars. It is only a question of a short time until 150,000 pounds will be the capacity of our freight cars. Cast metal is getting beyond its usefulness for heavy cars. I wish to say that the cast-iron wheel has given excellent service under 60,000-pound cars made today, but the increased load demands the substitute. If the cast-iron people guarantee their wheels for heavier cars, why not guarantee them for locomotive driving wheels? Now, gentlemen, what I have said I have said sincerely; my statements have been made in perfect good faith.

Mr. Hubbell: The basis of Mr. Francis' paper appears to be: Because cast-iron wheels are not used for locomotive driving wheels, it follows that cast-iron wheels are, therefore, not safe and should not be used under cars. I think Mr. Francis has entirely overlooked the fact that the locomotive drivers have to perform an entirely different service than the wheels under freight or passenger cars.

Mr. R. V. Wright:—I would like to ask if any gentleman present, can give us a comparative mileage made by cast iron and steel tired wheels?

Mr. G. E. Carson:—As to the question of the comparative mileage of cast iron and steel tired wheels, I find under our freight equipment, that cast iron wheels under cars of 60,000 capacity and lighter capacity are giving us on an average 52 months' service, and under 100,000 capacity cars 32 months' service. The wheels are then removed on account of worn flanges.

We have a class of 80,000 capacity cars under which the wheels have been in service 46 months, and present indications are that it will not be necessary to remove them for at least 10 or 12 months. I would of liked very much to have been able to give the mileage of these wheels but at the present, I have not any figures at hand.

In regard to steel tired wheels under our passenger equipment, I find by basing my figures on wheels removed on account of worn out, that on an average, they remain in service 52 months, with a credit of 321,239 miles per wheel.

Mr. A. W. Slocum:—As to the comparative mileage; there have not been enough of the steel tired car wheels used in freight service to make a fair comparison. The railroad men as a body have such consummate faith in the cast iron wheels that they use them exclusively. One of the largest railroads in existence has been making experiments, and I have the statement of Mr. A. W. Gibbs, Mechanical Engineer of the P. R. R. at Altoona, that they have not found a steel tired wheel that is satisfactory.

J. H. McConnell:—If there is nothing more to be said on this subject, with your permission would like to say a few words. In the United States to-day there are about one million five hundred freight cars in service, having twelve million cast iron wheels under them, at a cost of about $75,000,000. If these were replaced by steel tired wheels, the cost would be about $480,000,000. The average mileage made by freight cars throughout the United States is about twenty-one miles per day.

It seems Mr. Francis is not yet quite clear as to the way of mating wheels in machine shops. As the wheels come from the foundry, they are marked with a tape measure and stenciled one, two, three and four. Wheels made from the same metal on the same day will vary in size. Frequently, four different sized wheels will come from the same heat. It is the practice of the wheel maker to measure them and the size is indicated by the tape number. By this means, it is unnecessary for the man who fits the wheels to caliper them.

The wheel maker is surrounded by a great many conditions over which he has no control. He is confined to a certain weight. He is confined to a certain thickness of flange. (This cannot be varied; it must not be over 1⅜" thick.) He must guarantee the mileage of the wheel, also the chill. He is also subject to the drop test, and in a great many instances to the thermal test. If he gets too high a chill on the tread, it is apt to make the chill too deep in the flange and there will not be enough gray iron underneath to make a strong flange, and the result is the flange will break if it is chilled too deep. The thick-

ness of the flange cannot be increased, on account of the frogs and switches throughout the country. The throat of the frogs and switches runs about 1¾". That limits the thickness of the flange on all wheels. It is the practice of some roads to specify a certain mixture. In addition to this, there is the regular drop test and the thermal test, together with a guaranteed mileage. Believe if railroads would say to the wheel maker, you make the best wheel that will give the service and the mileage, use your specifications, but subject to the drop test, we will pay you for it, believe a better wheel would be made, but the conditions are made very rigid and no additional compensation allowed. It was the practice sometime ago to grind the tread of all wheels, for which the wheel maker received twenty-five cents extra. Believe this practice is not now very generally followed.

The general run of cast iron wheels as a rule will fulfill their guarantee as to mileage. Know of a case of the mileage taken from 100,000 wheels of a certain make and the average mileage was found to be 80,000 miles. The largest portion of the wheels removed is on account of cut flanges. Believe this amounts to about 33 per cent.

There are a number of large roads throughout the country that use cast iron wheels under passenger cars, and their service has been satisfactory, while other roads will not allow cast iron wheels to be used under passenger equipment, and use exclusively a steel tired wheel for this service.

Experiments are now being made by one of the large roads with two different makes of steel tired wheels under their 100,000 ℔. capacity freight cars. Four hundred of each make of wheels are in service. There is no data yet furnished with regard to the service of the forged steel wheel. Cast steel wheels were used several years ago, but were not successful. Do not see how on a forged steel wheel the density of metal can be obtained in the tread which will give a mileage equal to the cast iron wheel or a steel tired wheel. If it is necessary to turn the forged steel wheels as often as it is necessary to turn the steel tired wheels on the passenger cars, it would require a large

amount of machinery in all the railroad shops to keep these wheels in shape.

The remark was made that the axles now under freight cars are too large and could be reduced in size. Believe the size of the axle is proportioned in order to get the proper size journals to carry the load without heating. If a smaller journal would do it, railroads would not put them in, and it has been necessary to increase the size of the axle in proportion to the weight of the car.

Mr. Slocum spoke of the longitudinal seams. Do not believe, as a rule, those were in the wheel when cast. Am disposed to believe that they came there after the wheels were in service a given length of time. In passing around a curve, there is a thrust against all of the flanges. This in time on a heavily loaded car is liable to produce these longitudinal seams, particularly if the car is down on its side bearings. On investigating some broken wheels, found these longitudinal seams were ¼" deep before the wheel broke and the surface of the metal was blue, indicating that the crack gradually extended down until it got below the safety limit, when the flange broke out.

President: — Under the head of announcements, we have two papers to present, one by Ira C. Hubbell, subject, "The Locomotive", and the other by R. W. Stovel, subject, "The Power Question-Locomotive Repair Shops". Both papers are of much interest and as they have been sent to the members as advance copies, if there are no objections we will only submit them in abstract to-day and they may then come up for discussion at our next meeting.

THE LOCOMOTIVE.

BY IRA C. HUBBELL.

Perfection is born of progress.

In a paper before the St. Louis Railway Club in December, the statement is made that the efforts of George H. Corliss to introduce the engine which bore his name " met with that seeming opposition which is born of the disposition of human nature

to criticise most severely those things with which it is the least familiar.''

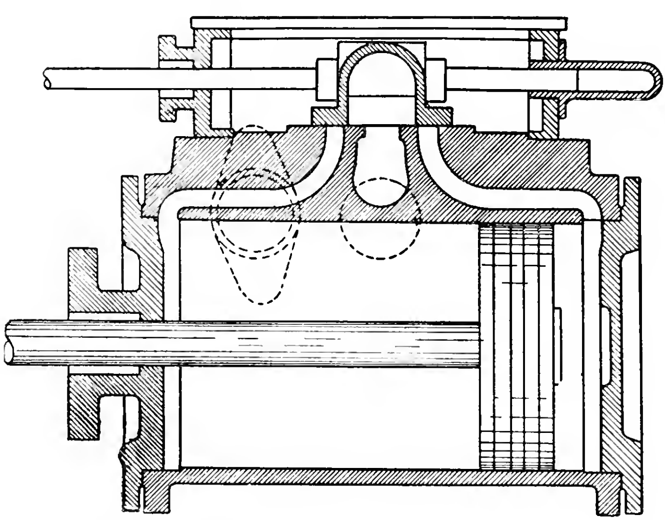
Byron clothes this thought in these words :—

''A man must serve his time at every trade
Save censure—critics are all ready-made !''

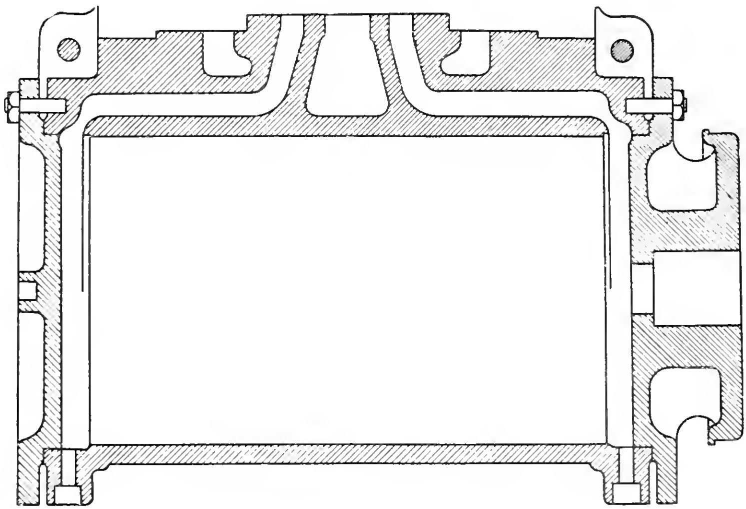
I have been much interested in the papers recently presented before the New York Club in November last, and before the Pittsburg Club in December last, and before the New England Club at their December meeting.

Three of the organizations for December last considered matters relating to the locomotive, and presumably because the locomotive is of great importance at this period, in connection with the net result of railway operation.

At the December meeting of the St. Louis Railway Club, I had the pleasure of presenting to the members a blue print made from a tracing made in 1863 of an eight wheeler designed by Mr. George W. Cushing, and built in 1864 for the Chicago & Northwestern Railway. The engine in question was called the '' Bartholomew,'' and had cylinders 16″ x 22″, and drivers 66″ diameter. This locomotive carried 130 pounds working pressure, and I am told that it was a smart piece of machinery. Below is given a sectional view of the cylinder of the engine, '' Bartholomew,''



and in the following cut is given a sectional view of the practice of the present day.



In the paper and discussion before the New York Club in November last, the points of advancement in the locomotive apparently emphasized were the change in details of the fire-box, increasing the length of the boiler, with longer tubes, application of piston valves and application of compound cylinders, or in other words, compounding the engines, and the published report gives half tone illustrations of a number of locomotives built for different roads, but the record does not show that there has been, after all, such advance in the locomotive since the early sixties as shown by two the preceeding illustrations as one might expect. Details of the locomotives are somewhat different; parts larger and heavier, but the steam distribution is practically what it was forty years ago. In this period the form of the valve has been changed, and at this time many are following the practice of some stationary engine builders and adopting the piston valve to the locomotive, and which no doubt somewhat relieves the valve movement, as the piston valve is claimed to be the better balanced, and this form of valve may improve the locomotive performance by permitting more direct ports to the cylinder and still maintain the necessary cylinder clearance required to harmonize with the valve movement.

In the New York meeting reference was made by one speaker to some engines constructed for the Chicago & Northwestern Railway, having piston valves and with the cylinder clearance reduced to five (5) per cent. I think the *American Engineer and Railroad Journal* of October, 1900, published a series of cards from one of these engines, and if you will look up these diagrams, you will notice that the compression is carried considerably above the initial pressure, and that excessive back pressure is present, indicating that clearance was reduced below the point justified by the valve movement, and the locomotive in question must necessarily be operated at a great loss. The following diagram is a fair average of those published in the paper mentioned :

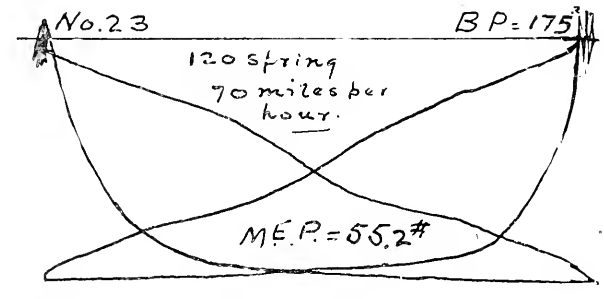


Fig. 1.

Another said "The American locomotive is decidedly more wasteful of steam than those made in other countries, which I believe is due in a great measure to enormous piston clearance, (no doubt referring to cylinder clearance), "caused by the huge valves employed," and continuing says : "The piston valve, which is a movement to increase the steam ports and hence to increase the clearance—" * * * * *

I am not sufficiently familiar with European practice to affirm or deny the statement of relative economy of European and American engines, but I want to emphasize the point developed as to the effect of cylinder clearance upon the economy of the steam engine, including in this statement the steam engine wherever found, whether upon land, sea or in mid-air, and would refer you to the paper before the St. Louis Railway Club at their December meeting.

The gentleman is, however, wrong in his deduction as to the piston valve necessarily increasing the cylinder clearance, and the indicator card, Fig. 1, substantiates my statement.

A number of diagrams were published in the New York proceedings, and I desire to here reproduce the following cards for a comparison :

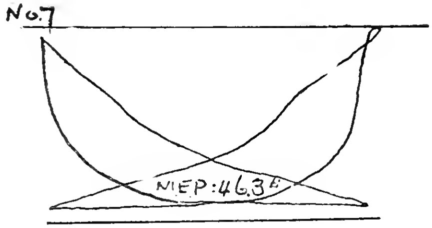


Fig. 2.

This card was taken at a speed of 75 miles per hour, the drivers turning 319 revolutions per minute, and the record of the valve setting, states that at 5″ cut-off the lead is $\frac{9}{32}$″ ; pre-admission not given.

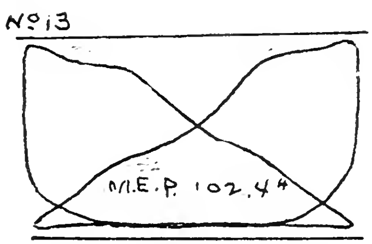


Fig. 3.

The card Fig. 3 was taken at a speed of 32 miles per hour, with the drivers making 138 revolutions per minute. At 9″ cut-off the lead is $\frac{1}{4}$″ ; pre-admission not given.

The digrams Figs 4, 5 and 7 were not taken from any of the locomotives illustrated in the New York proceedings.

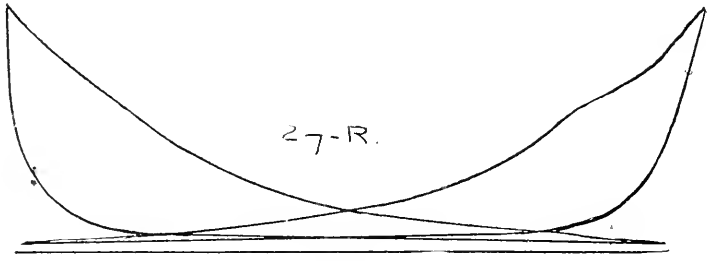


Fig. 4.

When diagram Fig. 4 was taken the drivers were making 330 revolutions per minute; with drivers 80″ diameter, this would give us a speed of nearly 80 miles per hour.

At 4″ cut-off the lead is $\frac{3}{64}$″ inches and the preadmission one quarter of an inch.

The diagram Fig. 5 was taken when the drivers were making 132 revolutions per minute.

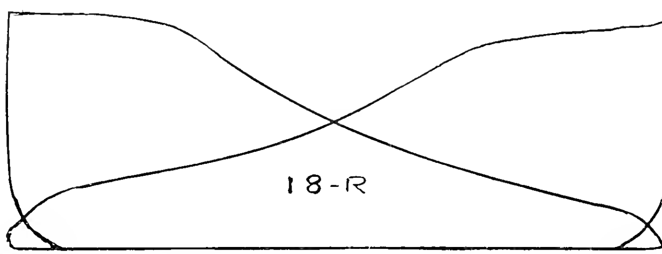


Fig. 5.

At 6″ cut-off the lead is $\frac{1}{8}$″, and at 12″ cut-off the lead is $\frac{3}{32}$″. At 6″ cut-off the preadmission is one-eighth of an inch, and at 12″ is one thirty-second of an inch.

The diagrams 4, 5 and 7 are introduced to call your attention to a radical change in the steam distribution of the locomotive, the one at a very early cut-off and at high speed, the others of later cut-off, moderate speed and selected to compare with the digrams Figs. 2 and 3, and to develop some things that effect the power of our locomotives which are not disclosed by the steam engine indicator.

The pre-admission at point of cut-off when diagram Fig. 2 was taken is probably not less than 3″. but the blending of the lines in the diagram scarcely reveal this fact, and yet it seems to me that the point is one calling for close attention to avoid a serious loss.

In the paper before the New England Club in December, the question is presented: " Whether the distribution of steam in the cylinders of simple engines is satisfactory; whether, for in-

stance, we ought to persist in our efforts to secure square cornered cards. The reply is that in most cases the distribution, as obtained from present gears, is satisfactory," and continuing, the paper states: "Anyone who attempts to increase the power of a modern locomotive by improving its steam distribution will find but a narrow margin upon which to work."

I am sure that the writer of that paper means to convey to the public the spirit of his meaning rather than its letter.

He is correct in the opinion that no particular economy results from simply a straight steam line, nor does loss necessarily follow in the distribution where the steam line falls away from a line parallel to the atmospheric line, but the intimation that the existing steam distribution of the average locomotive of to-day is all that can be expected from the simple engine, is erroneous, as proven by diagrams Figs. 4, 5 and 7, and he is also in error in assuming that the power of the present locomotive cannot be increased through improvement in its steam distribution. Here let me say that the term Steam Distribution, as used by your speaker, is not restricted solely to either the valve, the valve movement or to the cylinder and steam chest design, but comprehends and includes all three as constituting the Steam Distribution.

Below is given a diagram from a locomotive on one of the well known lines of the West.

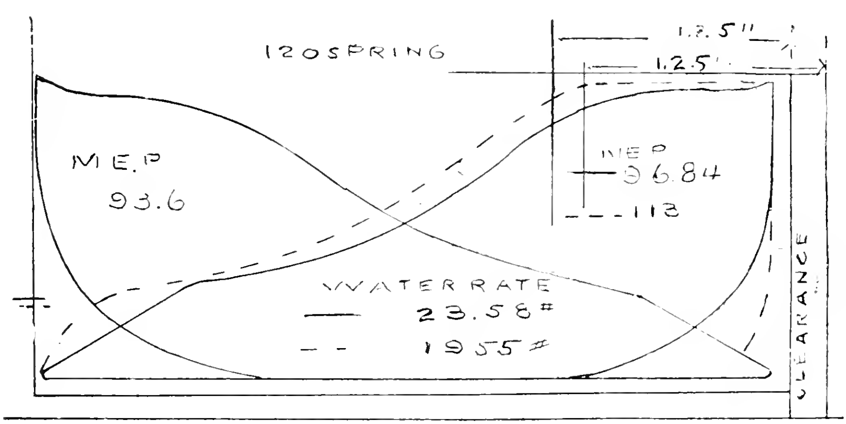


Fig. 6.

We all recognize in this an excellent card, yet by changing the steam distribution so as to be able to reduce the cylinder clearance, the m. e. p. for the same quantity of steam admitted is increased from 96.84 pounds to 113 pounds, as shown by the dotted diagram, or an increase in the engine's tractive power from 16,-510 pounds to 19,260 pounds, with no increase in the steam consumption.

Preceding the quotation just given the paper states : * * * * "The maximum power depends upon the boiler capacity and *upon the efficiency of the engines*, and upon nothing else. * * * * *whatever operates to reduce the consumption of steam per unit power developed, will extend the limit of maximum power.*" The italics are introduced by your speaker to substantiate his interpretation of the first quotation given from the New England Club paper to effect that the first quotation should be taken in its spirit and not in its letter.

The following diagram, taken from a 75 ton Mogul with 61″ drivers, hauling 25 cars, 745 tons, at a speed of 15 miles per hour on a 41 ft. grade, is submitted as showing what can be done with the simple engine, and as offering a correct basis from which to develop the compound locomotive. The diagrams Figs. 4 and 5 are from the same locomotive.

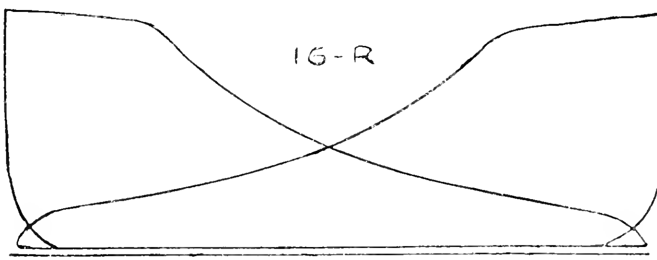


Fig. 7.

The cylinders on this locomotive are 20″ diameter, 26″ stroke and the cylinder clearance is less than 2½ per cent. of the piston displacement. No change is made in the eccentrics, blades or links.

THE POWER QUESTION — LOCOMOTIVE REPAIR SHOPS.

BY R. W. STOVEL, ELEC. ENG. P. & L. E. R. R.

The object of this paper is to lay before you a line of argument which may be of use in governing the selection of a power system for locomotive repair shops.

All Railroads have these shops, and in building either new shops or additions one of the first questions which arise after the selection of ground and general arrangement of buildings is that of a power system.

This power system may in general be said to include power for light, power for tools, power for cranes, compressed air, possibly some power in connection with a heating or ventilating system, also live steam and heat.

It is not thought necessary to go back to the days when each line shaft was driven by a small steam engine, where gas or oil was used for lighting and where manual cranes were the only ones to be had. We will therefore assume that the almost universal present day practice that of having a central boiler plant together with a central generating plant for electric light and for motors for power purposes is to be our starting point.

The system to be chosen is naturally that one which, all things considered, produces most economically proper light, power, steam, air and heat. Now the kind of electrical system alone has little effect on the steam, air or heat, so that it apparently appears that the system which performs the functions of light and power most economically is the one which will on the whole prove the proper system.

We may divide the question of power into three divisions, in most cases they will probably be equal in importance as far as the consumption of power is concerned. These three divisions are cranes, constant speed machines and variable speed machines.

Taking CRANES first, the best system available to-day is the direct current system of either 220 or 500 volts. Even advocates of alternating current motors will tell you that direct current motors are still certainly as good as alternating current motors for crane service, the maintenance being about equal, nor is there any doubt that alternating current cranes of the present day cost over 25% more than direct current cranes of the same capacity. The items of cranes then would lead us to the adoption of a direct current system.

Taking next CONSTANT SPEED TOOLS such as blowers, fans, shears, punches, etc., the general belief of the present day is that alternating current motors although costing slightly more than direct current motors are more economical because they require less attention and cost less for maintenance than the direct current motors. Our constant speed requirements, therefore, would point to the adoption of the alternating current system.

Taking next the VARIABLE SPEED TOOLS such as lathes, boring mills, drill presses, shapers, planers, etc., we find that in the past these machines have been driven from line and counter shafts with multistep driving cones. Investigation into this method of driving devoloped a considerable waste of power in the shafting and its bearings, this power was determined in a great many cases and found to amount to so much that several large machines were driven by separate motors in order to obviate this loss in power by doing away with shafting for these machines, it also had the effect of causing these tools to be divided into groups with as little line shafting as possible each group being driven by a motor. This question of group driving has been pretty thoroughly gone into and the main question in connection with it at the present day is, what shall be the size of these groups and where will we stop putting individual motors on each tool, looking at the question from this standpoint of power we can express the loss due to line shafting by means of a curve, as is done later in Plate No. 1.

If, however, we look into these variable speed tools from another point of view and begin to question what denotes the efficiency of the tool we will soon see that the more pounds of metal per hour consistent with good work which one tool removes over and above another tool of the same size and class is

an expression of its efficiency. We must therefore continually have in mind driving these tools so that their output will be a maximum. If we analyze the factors bearing on the output of a tool we find that the depth of cut, the width of cut, the speed of cut and the man operating the tool are the factors governing its efficiency.

In most work done in locomotive repair shops the depth of cut is fixed, there being a given thickness of metal to remove, the amount of feed is also fixed by the strength and power of the tool, by the strength of material worked on and by the assumed condition of good work. The point then to which we must look for increased efficiency of the tool are its speed and its operator and looking into the speed of machine tools driven by cones we find that in nearly every case looked into the increment of speed from cone step to cone step is over 50%, this means that in some cases the operator no matter how hard he may try cannot possibly get his proper cutting speed within 49% and in the average where as in locomotive shops the work is widely varying through a large range of sizes and quality of materials the average waste of time in cutting speeds must be 25% even if the operator changes his belt on all conditions and much greater if he does not continually change his belt. We can readily see then that a cone driven tool is not by 25% as efficient as it might be during its working time. Now if the operator or some one over him cannot judge the proper cutting speed to within 50%, this method of driving would be as good as practice required, if, however, it is possible for the operator or some one over him to judge the proper cutting speeds within 10% we should certainly demand on our machine tools a method of drive which will allow adjustment to within at least 10% of any given speed and failing in this we can express the loss in dollars and cents on the man's time.

Now variable speed motors may be applied to all tools and give a range of speeds each one not encreasing over 5% above its preceding speed and if we do not take advantage of this method of drive we can express the loss when using 50% speed steps as is done later in Plate No. 2.

Having now gotten a proper means of expressing how much it is to our advantage to do away with shafting and to obtain a

close regulation of speed as is done later in Plates No. 1. and .2 we can sum these two advantages and compare against them the first cost of a system with no shafting and having variable speed control; this is done later in Plate No. 3.

Assuming then for the moment that we have proven it desirable to have an individual variable speed motor on each tool, you will find on investigating the present day market for such a device that there are about three standard methods of obtaining these results.

It is not the intention of the present paper to discuss the different ways of obtaining these results especially as all three require the same kind of electric system, namely, a 220 volt direct current installation.

Now if it has been shown that we need a 220 volt direct current system from a consideration of our variable speed tools, we must inquire how this system will carry out the other functions.

We find that for crane service it is undoubtedly the best system at the present day.

As to constant speed motors it is next best to alternating current induction motors and the difference between these two systems is an increased first cost in favor of the direct current motor with the decreased maintenance against the direct current motor.

As to light we are unable to use either 110 or 220 volt incandescent lamp and 110 volt constant potential arc lamp which is the best type of arc lamp at the present day.

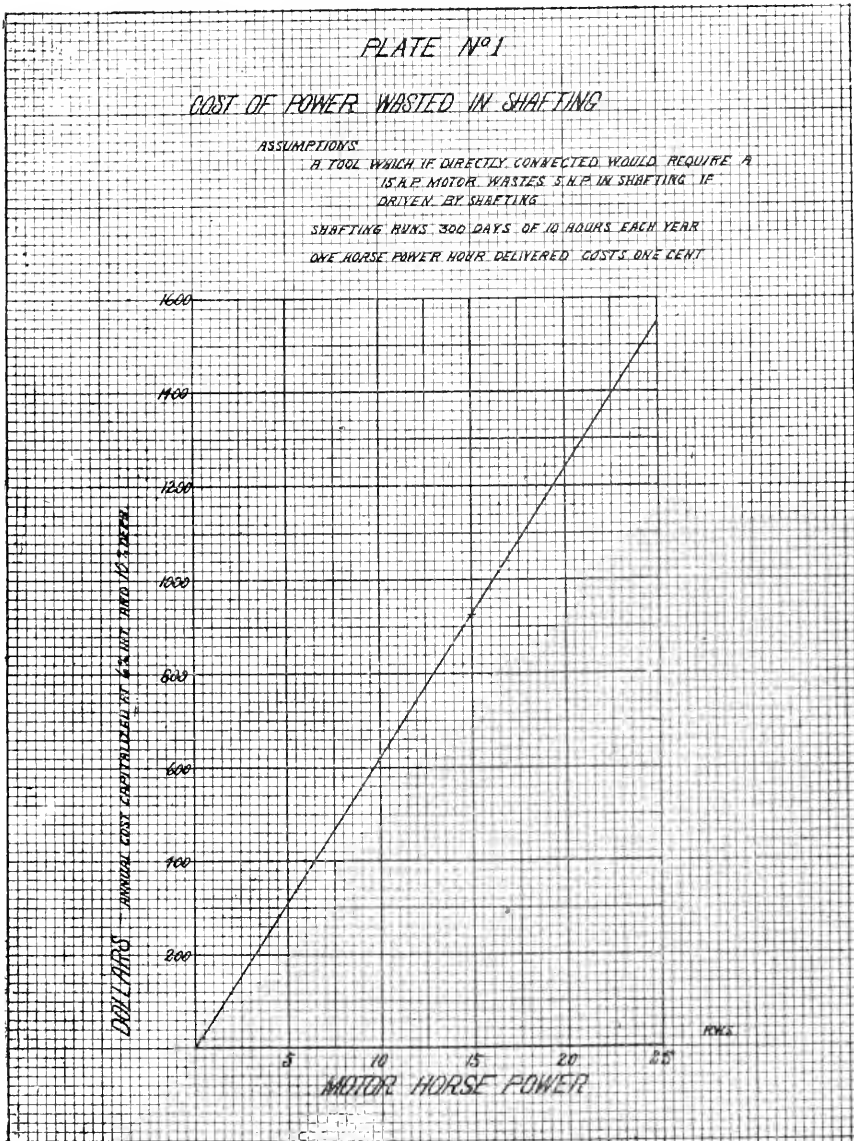


PLATE Nº 1
COST OF POWER WASTED IN SHAFTING
ASSUMPTIONS
A TOOL WHICH IF DIRECTLY CONNECTED WOULD REQUIRE A 15 H.P. MOTOR WASTES 5 H.P. IN SHAFTING IF DRIVEN BY SHAFTING
SHAFTING RUNS 300 DAYS OF 10 HOURS EACH YEAR
ONE HORSE POWER HOUR DELIVERED COSTS ONE CENT
1600
1400
1200
1000
800
600
400
200
DOLLARS — ANNUAL COST CAPITALIZED AT 6% INT AND 10% DEPR.
5
10
15
20
25
MOTOR HORSE POWER

EXPLANATION OF PLATE NO. 1.

This curve is an expression of the cost of power which is consumed by the shafting in the machine shop.

It is assumed that for each horse power delivered at a tool driven by shafting another horse power is required to drive the shafting. Prof. Benjamin in his paper of 1897, finds that out of 12 shops considered, 10 required more horse power to drive shafting than the average horse power load on tool. Now a tool if driven by a motor should certainly not have a motor of larger horse power than three times the average working load, hence the assumption that a tool driven by a motor of required horse power, will if driven by shafting waste one third that horse power in driving the shafting.

It is also assumed that the shafting runs 10 hours each day and 300 days a year.

The curve shows the annual cost, capitalized, of power wasted in shafting on the assumption that one horse power hour delivered costs one cent and that we capitalize annual cost at 6% interest and 10% depreciation.

As an example take a tool requiring a 15 H. P. motor, it is assumed the average load will be 5 H. P. and if the tool were driven by shafting there would be a loss of 5 H. P. continually being absorbed in shafting for this tool. In 300 days of 10 hours each we have lost 15,000 horse power hours, which, at one cent, would mean 150 dollars a year. Capitalizing this at 16%, we get 937 dollars, the amount as shown on curve for a tool requiring a 15 H. P. motor.

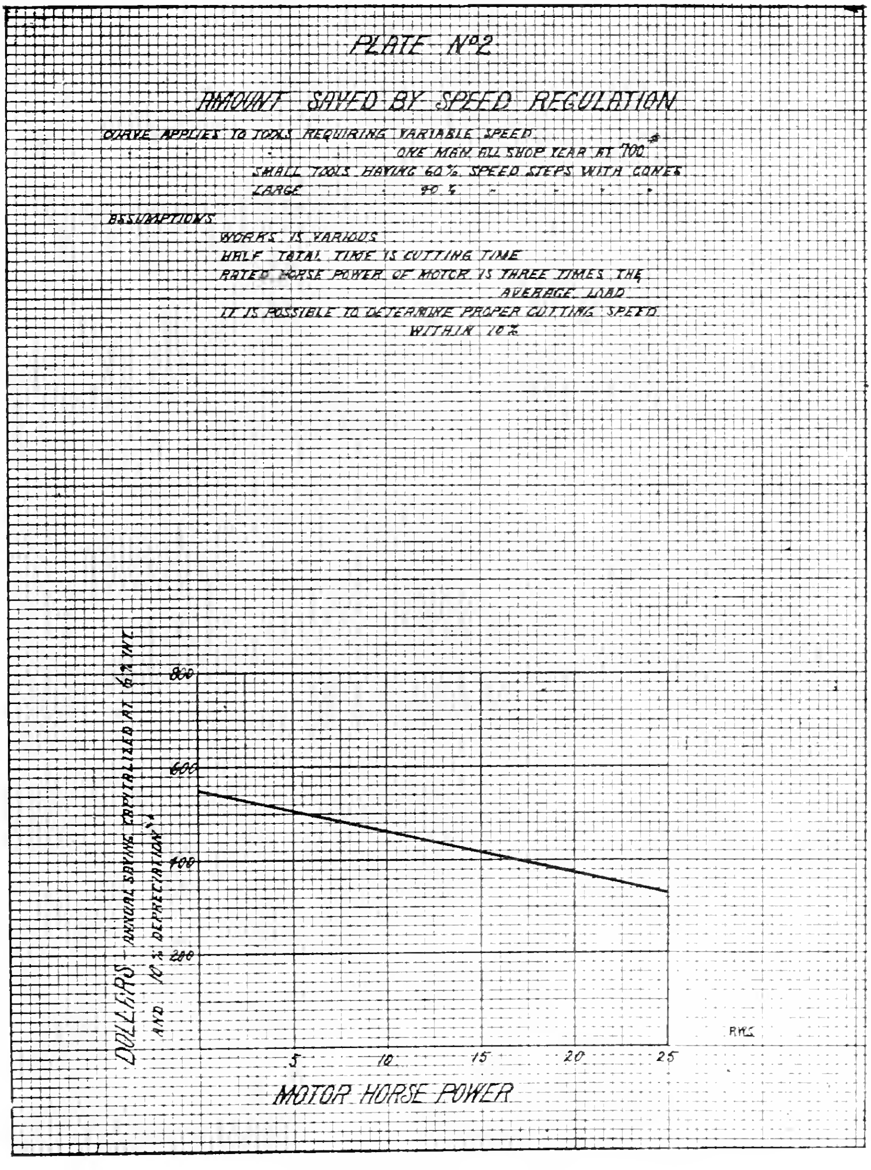


PLATE Nº2
AMOUNT SAVED BY SPEED REGULATION
CURVE APPLIES TO TOOLS REQUIRING VARIABLE SPEED
ONE MAN ALL SHOP YEAR AT 700 $
SMALL TOOLS HAVING 60 % SPEED STEPS WITH CONES
LARGE 40 %
ASSUMPTIONS
WORKS IS VARIOUS
HALF TOTAL TIME IS CUTTING TIME
RATED HORSE POWER OF MOTOR IS THREE TIMES THE AVERAGE LOAD
IT IS POSSIBLE TO DETERMINE PROPER CUTTING SPEED WITHIN 10 %
DOLLARS – ANNUAL SAVING CAPITALIZED AT 6 % INT. AND 10 % DEPRECIATION
800
600
400
200
5
10
15
20
25
MOTOR HORSE POWER
RWS

EXPLANATION OF PLATE NO. 2.

This curve is an expression of the amount saved by having variable speed tools capable of a close speed regulation. The first general assumption is that this only applies to tools requiring variable speed, such as lathes, boring mills, drill presses, planers and shapers.

It is also assumed that these machines require one man's attention all the shop year.

It is also assumed that the work is of varying diameters, that is that the work is not all one size, in which case only one proper speed would be required.

It is also assumed that cone driven small machines have 60% speed increments from one step of cone to the next step, and that large machines have 40% speed increments. If now the speed increments from cone to cone are 40 to 60%, and it is possible to determine the proper cutting speed within 10%, the drive of the tool is certainly not properly designed, and if, by applying a motor to the tool, we can adjust the speeds to within 10% we can express the amount saved by this system over and above the system by cone driving. For instance, if there is 60% difference in cone steps, then the average loss is 30% from a theoretical possibility on the cutting time of tool.

We here make the additional assumption that half the total time is cutting time, the authority for this must necessarily be experience. On some large tools cutting time has been determined to be as high as 70%, and in some cases where the work is difficult to chuck it is probably as low as 30%. The tendency of the present day is, however, to simplify means of chucking, and several men connected with machine shop management have advised me that the above assumption is a fairly conservative one.

If, then, we have a loss of 30% on cutting time, this will mean a loss of 15% on the man's total time. Now balancing this against a 10% speed step system, which gives a loss of 2½% on the man's total time, we find we save 12½% of the man's time. Taking a man's wages, then, at $700.00 a year, we save $87.50 a year, which, capitalized at 6% interest and 10% depreciation, represents $550.00.

Similarly, if we take a larger machine, say one requiring a 25 H. P. motor which has 40% speed steps on cones, and reducing this to loss on the man's total time, we can get an expression of the difference between this type of machine and one with 10% speed steps, hence curve on Plate No. 2 as drawn.

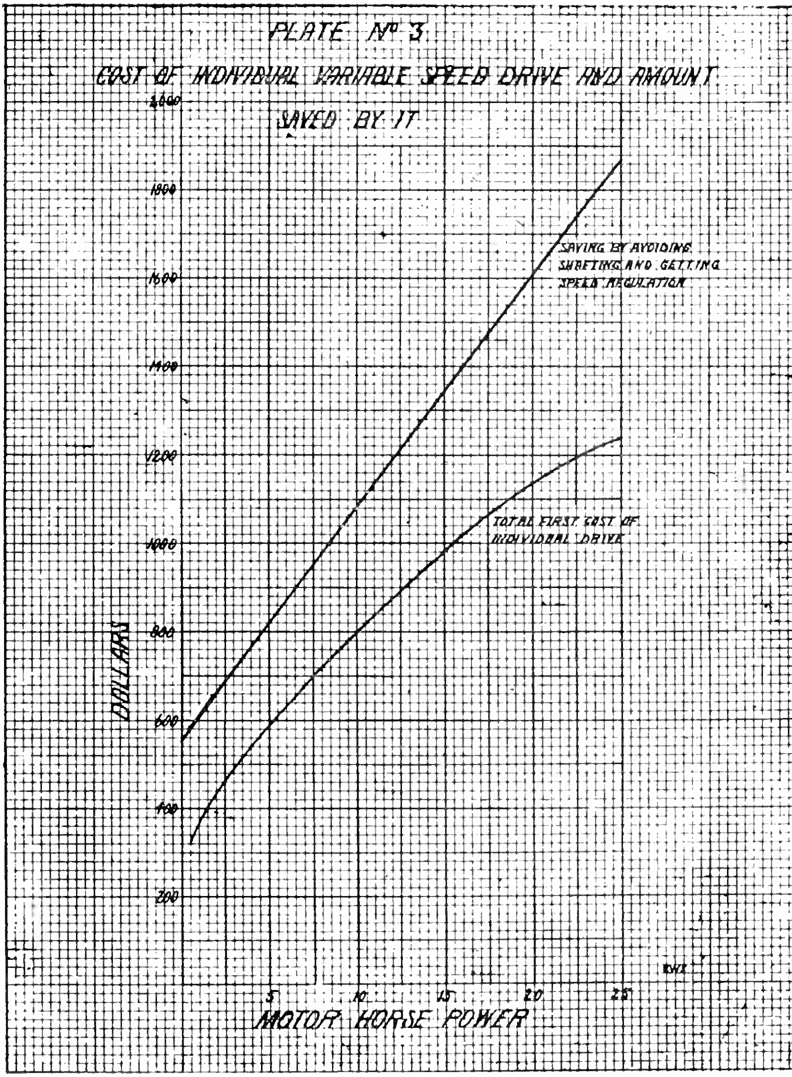


PLATE No 3
COST OF INDIVIDUAL VARIABLE SPEED DRIVE AND AMOUNT SAVED BY IT
2000
1800
1600
1400
1200
1000
800
600
400
200
DOLLARS
SAVING BY AVOIDING SHAFTING AND GETTING SPEED REGULATION
TOTAL FIRST COST OF INDIVIDUAL DRIVE
5
10
15
20
25
MOTOR HORSE POWER

EXPLANATION OF PLATE NO. 3.

The upper curve shows the combined savings from consideration of power and of speed, namely, the sum of curves on Plates No. 1 and No. 2.

The lower curve shows the cost of applying a motor drive which will do away with shafting and give a variation of speed throughout range by 5% steps.

This cost includes motor, controller, from 50 to 150 dollars for connecting motor to tool, and from 40 to 75 dollars as the proportion of each motor for additional wiring and appliances of system under consideration. These costs being based upon a shop requiring about 30 variable speed tools.

This cost curve is that of applying the most expensive of the three methods now in use, and being so, forms a good basis of comparison.

Looking at the two curves on Plate No. 3, we see it is decidedly advantageous to apply variable speed motors to most of our tools, and the results deduced may be stated concretely.

It is to the advantage of any machine shop to put an individual motor on a 16″ lathe, provided this tool is busy throughout the shop year, that is, keeps one man busy all the time on a variety of work.

It is advantageous to put an individual motor on all variable speed tools which are busy throughout the shop year, regardless of their horse power requirements.

It is also to be deduced that since no credit has been allowed for shafting or motors used for group driving, that it will actually pay to change over existing shops to individual motor drives.

Having thus shown that for most shops individual variable speed motors are the most desirable drive, we may proceed to discuss the subject and some of the included assumptions more in general.

The disadvantages of individual drive are as follows:

1. Increased first cost and depreciation.
2. Maintenance of motors.

The first objection, that of increased cost and depreciation, is shown above to be an economical expenditure.

As to the second objection, that of maintenance of motors, the day is rapidly passing away when a motor is a novelty, and

motors as now built are a good mechanism. One shop having over 100 motors advises that one man takes care of them, and another shop having 450 motors advises they are cared for by three to four men at about $2.00 a day. This is certainly not much more labor than that required for proper maintenance of belts and shafting for the same number of machines.

The advantages of individual motor drive are:

1. Increased light and cleanliness.
2. Ease of control of speed.
3. Arrangement of machines.
4. Facilities for additions.
5. Design of building.
6. Headway for cranes.
7. Overtime working.

As to increased light and cleanliness, which has been put at the top of the list, it must be remembered that the labor bill is the largest item in the operation of a repair shop, and everything possible must be done to make this largest item an economical one. Anything which may be done to add to comfort and facility of the men employed, while hard, owing to lack of statistics, to show in dollars and cents, must, however, materially cheapen cost of operating.

The second advantage, that of ease of control, is a feature of individual driving which contributes almost as much to economic operation as the ability for close regulation.

It was mentioned above that economic operation of variable speed tools depended upon the speed and the operator. The speed is taken care of in the design of the system, but unfortunately we cannot so easily take care of the operator. The best we can do is to make the operation of speed variation as easy and convenient as possible, and this can be approached by the individual motor driving system, for which the controller is of an enclosed type very similar to those used on street cars. This controller is operated by a lever which starts, stops and controls speed of tool.

On lathes this lever is carried directly on the apron, so that operator has full and easy control of tool by a lever directly under his hand.

On other tools the operating lever may be mounted at the most convenient point or on very large tools a series of levers at different points may be arranged.

It is at once seen that this is a great improvement on shifting belts and will certainly result in some material saving, though just how much it is difficult to say.

While of course this does not by any means solve the problem of getting the best out of the man, it is certainly a step in that direction.

This method of motor drive also allows us to arrange our machines with relation to the progress of the work alone, and not with regard to power groups or line shafting. This feature is probably not so important in a locomotive repair shop as in commercial manufacture, where the work can be routed, but it is certainly an advantage.

This system is also flexible for changes or additions, and it allows us to have a wider scope of design, low trusses not being required to carry shafting or columns designed to carry the vibrating strains. It further gives clear head room for cranes, which is not an advantage of motor drive alone, as several shops now driven by belts have clear head room for cranes.

We see then that if the first cost of individual motors can be shown to be economical, there are several other reasons why this method is desirable. It might also be mentioned that this method is the most economical as regards consumption of power, as though several motors may be running at a slightly lower efficiency than one driving a group, this is offset by the fact that consumption of power stops, when a machine is shut off, also that breakdowns, if any, only effect one machine; and in the shop above referred to as having 450 motors, statement is made that any tool drive can be replaced inside of half an hour.

Regarding assumptions which have been made, one probably may be questioned, namely, that it is possible to determine the proper cutting speeds within 10%,

The various methods of obtaining this result in operation would, like the different ways of obtaining variable speed drive, occupy a separate paper, but you are probably aware that a great deal is now being done to determine the limiting cutting

speeds of the various tool steels for various materials, and it is even claimed that some of them will cut when red hot before burning, thus giving an indication before breaking down. With a proper piece rate system and a little instruction, the men will take care of the cutting speeds. Where such systems cannot be applied a speed foreman or Mr. Gantt's bonus system may be adopted.

If you take a small rotameter and go into your shops you can readily determine the cutting speeds and learn what a wide variation there is on different tools cutting same material with same tool steel, and a very little watching will go a long way towards saving time, and thus money.

Regarding the cost of applying this variable speed drive, this includes cost of adapting it to existing machines and all machines as they come from the standard stock of the tool builders. Nor is its adaption difficult, the most convenient way being to cast a bracket for the motor and put a gear on the driving spindle connecting motor and driving spindles by Renold Silent Chain.

In conclusion, it may be said that while an effort has been made to make all assumptions conservative, the argument seems to point strongly to the radical policy of individual driving, and it is hoped a thorough discussion will either more clearly demonstrate the argument or develop its mistakes.

I wish to thank Mr. A. R. Raymer and Mr. Chas. Day for their assistance in connection with this paper.

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President:—There being no further business before the meeting, a motion to adjourn will be in order.

Meeting adjourned.

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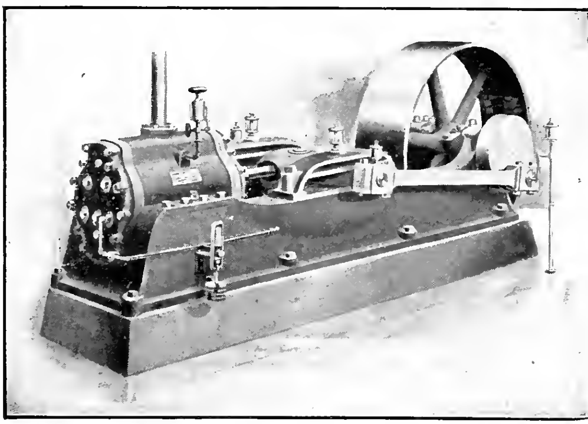

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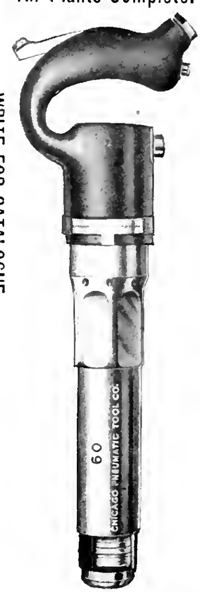

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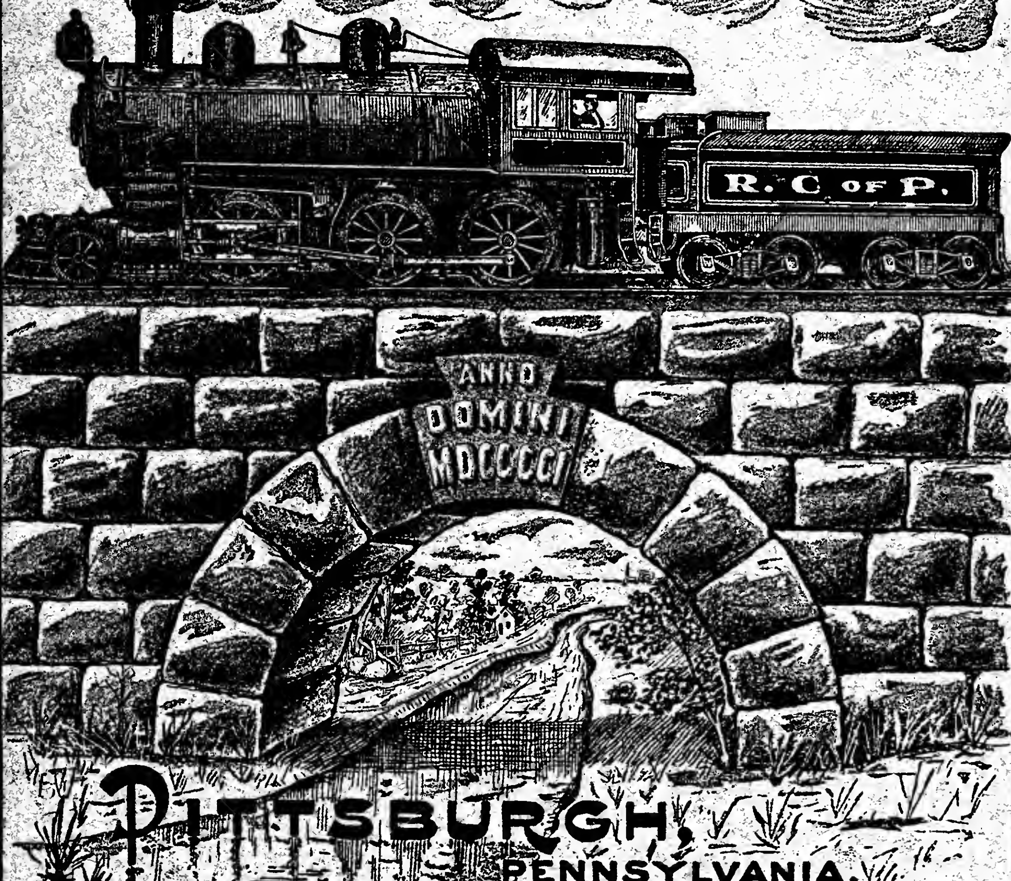

PITTSBURGH, PENNSYLVANIA.

MARCH 1902.

Classified Index of Advertisements

Index—Continued.

OFFICIAL PROCEEDINGS

of the

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ORGANIZED OCTOBER 18, 1901.

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VOL. I.
No. 5.

Pittsburgh, Pa., March 28, 1902.

$1.00 Per Year.
20c. per Copy.

Published monthly, except June, July and August, by the Railway Club of Pittsburgh,
J. D. Conway, Secretary, General Offices P. & L. E. R. R., Pittsburgh, Pa.

Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, MARCH 28, 1902.

The meeting was called to order at two o'clock p. m., at the Hotel Lincoln, with President J. H. McConnell in the chair.

In Memoriam.

Whereas, It has pleased an All-wise Providence
to take from our midst

Mr. Aaron French,

a member of this club, be it

Resolved, That in his death, not only the Railway Club of Pittsburgh, but this community, and the country at large, have sustained a great loss.

Developing, as he did, an industry which touched and connected both the railway and manufacturing interests, Mr. French was in himself a typical member of a club which takes in both of these interests, and of the community in which they form such important elements of its prosperity.

Beginning life with no capital excepting his own inherent energy and ability, the life of our departed friend was one which sets forth to every young man, however limited his advantages, the possibilities which the future holds for men of energy and ability. The passing away of such a man leaves a vacant place which it is hard to fill, but there is compensation in the thought that the forces for good which is set in motion during his lifetime, shall not pass away, but continue to bless humanity in the years which are to come.

To his sorrowing friends we extend our heartfelt sympathy, while at the same time we trust that their grief may be tempered by the memory of a life of such great usefulness.

H. W. WATTS,
L. H. TURNER,
J. E. SIMONS,
Committee on Resolutions.

The following gentlemen registered :

MEMBERS.

Atwood, J. A.	McNulty, F. M.
Campbell, A.	Obey, G. B.
Carson, G. E.	Raymer, A. R.
Caughey, E. G.	Redding, D. J.
Conway, J. D.	Simons, J. E.
Diamond, P. R.	Stark, B. F.
Forsberg, R. P.	Stovel, R. W.
Herr, E. M.	Thomas, R. L.
Holbrook, D. O.	Turner, L. H.
Loetscher, E. C.	Turner, J. S.
Mason, Stephen C.	Turner, Alex.
Miller, Ira H.	Watts, H. W.
McConnell, J. H.	Wright, R. V.

VISITORS.

Berry, Alfred G.	Howgate, Jas. R.
Bostwick, W. S.	Jackson, Thos.
Burke, John J.	Montgomery, R. B.
Caldwell, C. B.	Parke, R. A.
Churchward, Alex.	Pomeroy, Lewis R.
Crouch, A. W.	Richardson, W. P.
Dalman, John, Jr.	Reilly, T. S.

President: If the gentlemen will please come to order we will now open the meeting. Mr. Secretary, I think we had better take up the first item of business, the announcement of new members and omit the roll call and reading of the minutes.

Secretary: Mr. President and gentlemen, the following applications have been received and approved by the Executive Committee:

Harry W. Frost, General Manager Monarch Brake Beam Co., Detroit, Mich.

Robt. H. Blackall, Expert, Westinghouse Air Brake Co., Pittsburgh, Pa.

C. J. Donahue, C. C. to S. M. P., L. S. & M. S. R'y. Co., Cleveland, O.

J. T. Kirk, Rep. Jas. Bonar & Company Carnegie Building Pittsburgh, Pa.

T. W. Demarest, Superintendent Motive Power, Penna. Lines West, Columbus, O.

A. W. Crouch, Engineering Dept. Dearborn Drug & Chemical Works, Park Bldg., Pittsburgh, Pa.

Thomas Jackson, Rep. F. A. Lester & Co., Old Colony Bldg., Chicago, Ills.

Lewis R. Pomeroy, Spl. Rep. Ry. Dept. General Electric Co., 44 Broad Street, New York, N.Y.

President: Mr. Secretary, have you any communications?

Secretary: Read a number of communications, among them the following:

CHICAGO, March 26, 1902.

Mr. J. D. Conway, Sec'y., Pittsburg Railway Club,
Pittsburgh, Pa.

Dear Sir — I find it will be impossible for me to attend the meeting of the Pittsburgh Club on Friday the 28th inst., and I have also been so occupied that I have not had opportunity to prepare any discussion on the paper, that I might forward to you for use at this meeting, and I would therefore respectfully ask that if possible, discussion of the paper be postponed for one month.

If this cannot be conveniently done, I suppose it can be arranged to send me the stenographer's notes of the discussion, as it takes place, and an opportunity be given me to answer the same.

Very truly yours,
IRA C. HUBBELL.

President: Gentlemen, we have another paper to follow this one, on the "Power question—Locomotive Repair Shops," with which we can very well occupy the time this afternoon, and if there are no objections we will let Mr. Hubbell's paper go over until next month. I would like to hear an expression from you on that subject, however. Do you wish to discuss it to-day, or will we let it go over?

Mr. Turner: Mr. President, Mr. Hubbell has prepared a very able paper, and I move, as a courtesy to him, that it be laid over until next month.

Motion seconded and carried unanimously.

President: Anything under the head of "New Business?"

Secretary: Mr. President, since our last meeting we have had the misfortune to lose, by death, one of our members, Mr. Aaron French, who was a very prominent man in our city and elsewhere. I think it would be in order to take this matter up under this order of business.

President: Gentlemen, what is your pleasure?

Mr. H. W. Watts: Mr. President, I move that a committee be appointed to prepare suitable resolutions.

Motion duly seconded and carried unanimously.

President: The next order of business, gentlemen, will be the discussion of the subjects presented at the last meeting. As there are a number here who have not had an opportunity of reading this paper by Mr. Stovel, I would ask him to kindly read his paper for the information of the gentlemen present, and I think it can then be taken up in a more intelligent manner.

(Mr. Stovel read his paper: "The Power Question—Locomotive Repair Shops."

President: Mr. Stovel, it is customary for the author of a paper to open the discussion; will you kindly favor us?

Mr. Stovel: I have nothing to say on the subject, just now Mr. President.

President: Gentlemen, this subject is now open for discussion, and everybody who wishes will have an opportunity to say what they wish on this subject. We have with us to-day, Mr. Pomeroy, of the General Electric Company, and I would like to ask Mr. Pomeroy if he will not kindly start this off by giving us some of his experience.

Mr. Pomeroy: Mr. President and gentlemen—the advantages claimed for electric drives by some of its advocates seem to the uninitiated, quite "rosy," and the statements sometimes are so large and sweeping that they are open to suspicion, or lead to the belief that the claims are more apparent than real. In this connection one is reminded of the story of a man who was an inveterate smoker, talking with a friend who never indulged. The non-smoker addressing the other said: "How many cigars do you smoke in a day?" The other replied, so many, giving the number. "About how much do you pay for them?" the non-

smoker asked. Upon being informed he made a mental calculation and said, "Do you realize that at this rate, in——years you would consume the equivalent of a brown stone house?" The smoker thought for a moment and replied, "Well, Mr. Smith, you don't smoke, do you?" "No," said Smith. "Then where is your brown stone house?"

As to the paper of Mr. Stovel, I desire to commend it as a careful, succinct and able statement, in which I am greatly interested. There is one point, however, that I wish to mention, namely, that the mere economy of transmission is one of the least reasons or advantages in the use of electric drives, as the cost of power is so small a proportion of the total cost of operating the shop. It is like the increased cost of speeding up the trains on railways, which may show an increased coal consumption of 25 to 50 per cent. and yet this would make so small an increase in the total cost of operation per train mile, as to be practically negligible, as 50 per cent increase in fuel consumed would only cause an increase of about 30 per cent. in the total cost of operation. Therefore, if we have no other advantages except a percentage of power saved, we would have very little to offer in justification of electric driving. But it has been proven over and over again, that the advantages outside of this are so great, that the mere cost from the power standpoint, sinks into insignificance.

A great many people hold to the idea that it is necessary to install a central steam plant to generate electric current, based on the aggregate combined horse power capacity of the several tools in the shop; whereas advantage can be taken of cutting out the line shafting and calculations made on the basis of the average load and arrange the generating units accordingly. The loss of power from shafting is constant as long as the engine is running, whether one machine or a hundred be in operation, while the loss of electric transmission is a percentage of the actual power used as the consumption of current diminishes.

The Baldwin Locomotive Works, have, or had at the time the statement was made, an aggregate motor installation of 3500 horse power, and yet never have had occasion to deliver more than 1000 horse power at the switchboard.

Another shop, under the old method, required 150 horse power at the engine; whereas under electric conditions, there is

seldom required more than 80 horse power at the switch-board, notwithstanding the addition of a crane and many more machines; and further, numerous cases of similar import could be named.

The superintendent of a large shop remarked that if the concern he represented were obliged to do away with electric driving their pay-rolls would be increased 25 per cent. It is only fair to remark that in this particular instance this is largely due to the fact that doing away with overhead shafting permitted the use of electric cranes; however, this is a legitimate credit in favor of electric drives.

On page 111, Mr. Stovel speaks of the advantage of induction motors, and this recalls a statement made by Mr. George Gibbs, to the effect that "90 per cent. of all direct current motor repairs are to commutators and brushes." Incidentally, if this is so, it would seem to be an argument in favor of induction motors, as commutation is entirely done away with in this class of apparatus.

In concluding I wish to say, that it has been proven over and over again, that the employment of electricity for operating the shop, increases the output per day, per man, per machine, per square foot of floor space, increasing the quantity and enhancing the quality of the product, while decreasing the cost.

President: Gentlemen, this subject is open for discussion, and we would like to hear from everybody on the subject.

Mr. Loetscher: As has just been said, nine-tenths of the trouble with direct current motors is in the commutator. Compared with the rest of the motor, it is a delicate piece of apparatus, especially when in operation.

Despite the above objection, the 220 volt direct current system is the one most commonly used to-day. One reason for this is that the direct current motor is older and is better understood than the alternating current induction motor. But possibly the main reason is that, at present, the induction motor costs about 25 per cent more than a direct current motor of the same size. As the induction motor is so much simpler in construction than the direct current machine, I believe, that when the patents on it expire, and as many firms enter that class of work as are now engaged in the manufacture of direct current motors, that the cost of the induction motor will be considerably below that of

the direct current type, so this objection is simply temporary. The main objection to the induction motor in the machine shop appears when we wish to use it with variable speed tools. For the constant speed machines, such as punches, shears, fans, and wood working machinery, the induction motor is preferable, as mentioned by Mr. Stovel. For the variable speed machines, we can use a mechanical speed changing device, of which there are several types now on the market. These can readily be made so as to give a range of speeds varying by 5 per cent steps if desired. Possibly also something may be done by means of multi-frequencies; this would of course, be the ideal method if a good frequency transformer could be made.

In regard to the relative economy between the group and the individual drive, I believe that each case must be analyzed separately. Where we have machines requiring but slight changes in speed, or a group of small special machines which are operated at intervals, I believe that grouping would be found the most economical plan, without reducing the production. While for the larger machines, and for machines requiring variable speed, an individual induction motor with a mechanical speed changing device would be the proper outfit.

Alex. Churchward: I am very much interested in what the gentleman said in regard to induction motors. I think when we get a mechanical device which will give us the speed results which he mentioned, we will have the question settled for all time, but so far as the trouble from commutation goes, in direct current motors, there is really very little trouble. The talk about commutator trouble is really much greater than that which actually happens in practice. A little care and the low voltage (namely 250 volts) for which the modern shop motor is wound, there will be very little trouble. For instance, the case mentioned where there were 450 motors installed in one shop and only one or two men to look after them, it cannot be said that there was very much trouble. Outside of these few remarks, I do not know of anything I wish to add to this very able paper.

Mr. R. V. Wright: The question has occurred to my mind whether we could gain the full advantage of the variable speed, with the grade of machinists some of our railroad shops employ. In any event it would be necessary to have a foreman to look

after the speeds of the machines, at least until the men became used to them. However, even if the individual system did not show so great a saving over the group system, the advantages enumerated near the end of Mr. Stovel's paper, would lead us to decide in favor of it.

Mr. E. M. Herr: We have had our plant operated by electric motors for the past two and a half to three years. The question being more on power and locomotive repair shops, I have not given the subject sufficient careful study to give you an intelligent expression on the paper in question. In regard to the application of the electric motor driving in shops generally, I think that there can be but little question of its advantage over the steam engine. In our case, the installation of motors in the Westinghouse Air Brake Co. shops, was complicated by the conclusion of an entire change in the steam end of the power plant. Instead of driving our electric generators with the same kind of engines that the shafting was formerly driven; in making the change to motors, we changed from ordinary steam engines to the Parsons Steam Turbine, so that any data that we have in regard to relative economy and satisfaction of operating the plant, compared with that formerly used is, complicated with the (Turbine) element. We have found the installation of electric motors quite satisfactory, and the economy in driving the shop in that way, as against the old system is quite a decided one. We had the opportunity of doing something that is very seldom possible: that is to retain our entire steam plant, (the original plant) until we had the entire motor driven outfit installed. The original steam engines were retained so that we were able at the conclusion of the installation of the motors and their generating apparatus, to make a comparative test of the results of driving the shop with electric motors, and driving it direct with a steam engine. I might say that the steam engine driving was done by means of engines scattered about throughout the shop; we had some twenty-eight, if I remember rightly. I cannot give you the aggregate horse power, but it was in the neighborhood of 1500. They were not all driven to their full capacity. The substitution was made to 15 and 20 horse power alternating current induction motors, and these belted as directly as possible to sections of the main shafting. After we got the

new power plant installed we placed the belts on the motors and went ahead with electricity. We then ran ten days with the engines. The result was something over 30 per cent in economy in favor of the electric installation. I consider the economy due principally to the greater efficiency of the generating plant, the turbins running condensing, rather than to the motors. The motors, however, have the advantage in running over time of not having to operate the whole length of the shafting of the shop. The results I must say are quite satisfactory.

President: Mr. Herr, I would like to ask which you consider preferable, individual motor driving or driving a number of machines from a shaft which in turn is driven by the motor?

Mr. E. M. Herr: I fear, Mr. President, I am hardly capable of answering that question, as my experience is limited. We have but very few machines driven individually. Our work is of such a character that I doubt whether it would be economy to undertake to drive individually. That question is complicated considerably by the broad question of just the kind of work you are doing. I suppose using heavy machine tools and employing power in considerable units, it might be advantageous to use individual driving, while shops using small machines would find it better economy to group them.

President: Mr. Turner, can you give us any light on this subject?

Mr. L. H. Turner: Only this, Mr. President, that I appreciate that this paper is the result of very careful and intelligent investigation, and while I have no opportunity of personal experience with electric drive, I have no doubt it is preferable to what we are now using. It seems to me that we must get into line, and if there are any conditions in our shops, whereby we cannot get the ideal results as shown, we must bring the man up to the machine, and not bring the machine down to the man.

Mr. D. J. Redding: This question, Mr. President, does not seem to scare the belt men as badly as the question of steel wheels scared the cast wheel makers at our last meeting, although it strikes me that the man who sells belts might find fault with the direct connected motor which entirely dispenses with his product. However, the fact that a variable speed motor can be obtained, which will give you in five or ten per cent steps, a varia-

tion of speeds three times as great as can be obtained with belts and back gears, should make this system an absolute necessity in driving machinery economically. This is especially true in the operation of a railroad shop, where the work is varied and where you may be called upon to turn in the same lathe, work ranging in diameter from three to ten inches. Under these conditions, it is of course, impossible to obtain the maximum cutting speed on a belt-driven machine except on a few of the different diameters, while with the variable speed motor you could get practically the maximum with all diameters. And given this equipment, there is no good reason why the shop foreman should not see that the maximum speeds are used.

Mr. J. E. Simons: I have listened to a portion of this paper with a great deal of interest. Unfortunately I was not here for the first part of it, but I infer from what portion of it I did hear, that the gentleman is in favor of the individual driver for each machine. I am not prepared to say whether it is economy to do this or not. As you are aware, we have just started up a new shop, which is electrically driven, and we decided we would not put in anything less than a five horse power motor, and for powers above that instead of putting in anything between five and ten, or ten, fifteen and twenty, we decided if a machine required seven and a half horse power, we would put in a ten, and if it took ten horse power to drive it, we would put in a fifteen, so as to have a standard of motors. Unfortunately we did not have the opportunity Mr. Herr had in making a comparison of the engine and electric driving. We had no old engines or any old line shafting from which we could take any comparison. We are using at the present time quite a little belting in our shops to take care of light machines. We are grouping them and driving them by the belts. With reference to the smaller machines I think it will prove good economy to group them.

Mr. A. R. Raymer: It seems to me that in this discussion that the several different kinds of "electric drives" are being confused. The gentlemen in speaking of individual driving and of grouping have, I infer from their remarks, in their minds, motors of uniform speed; while the object of the paper is to

bring before you the advantages of having variable speed motors on machines needing them.

The gist of the argument in favor of the variable speed motors is, that by their proper use, the capacity of the machine so driven, is increased and the cost of production is reduced.

All arguments as to efficiency of an "electric drive" over shafting or individual motors (uniform speed) over grouping or vice versa, refer only to cost of transmitting power to the machines and have nothing to do with increased output, and apply to the "coal pile" only.

Now the cost of the fuel used, is on an average, not over three per cent of the cost of the article produced, (labor and other items in which time is a factor costing about forty-seven per cent and the cost of the material makes up the other half)

So a saving by transmission of power of ten per cent, or twenty per cent, or even thirty-three per cent on cost of fuel will amount to not over one (1) per cent on the cost of the article produced; while a saving of ten to twenty per cent on the *time* and *labor* factor in the cost of an article, by having the machine properly driven by a variable speed motor means a saving of seven per cent on the cost of the article produced, which is more than twice the *total* cost of fuel used, hence the importance of this method of drive.

I would like to ask the gentlemen who have spoken of mechanical speed changers on electric motors, whether or not there are any satisfactory devices of this kind on the market at this time?

President: We have two representatives of the General Electric Company here; possibly they might be able to enlighten us on that subject. Can you give us any information, Mr. Pomeroy?

Mr. Pomeroy: I have nothing specific to say, except that there are a number of devices produced by the tool makers which have a close approach to these requirements. There is one that was referred to in The American Machinist which promises very good results in that line. Not having a personal experience with this apparatus, I would prefer not to discuss it, however, at such long range.

Mr. R. W. Stovel: I assumed at the commencement of my paper, that electric motor driving in some form was to be adopted and have not touched on the question of steam engine versus motor driving, as I do not know of a case being installed, for the past few years, where steam engines have been motive power on shafts.

Mr. Pomeroy has stated that the fuel bill is only three per cent of total shop operation, while labor bill is forty-seven per cent, and deduces from this that we can neglect the power question altogether. This, however, is not quite the case, because the fuel used on the machine tool work is a much larger proportion of the cost of operating the machine tools and as is shown in Plate I, of the paper forms a very desirable amount to save as compared with the other possible savings of economic operation of machine tools. He has also stated that the cost of repairs of D. C. motors with A. C. motors is nine to one, which at a first glance, if correct, might seem overwhelming argument in favor of A. C. motors. The complete story is not told, however, until the amount of repairs in each case is stated, for if A. C. repairs cost one dollar then D. C. repairs will cost nine dollars, but if it costs several thousands monthly to operate shops the advantage of A. C. motors is not so convincing.

Mr. Loetcher questions if some way cannot be adopted to use an alternatnig current motor and a speed changer. The requirements outlined in the paper are absence of shafts and close adjustment of speeds throughout range, and the cheapest way this can be accomplished is the best solution. Undoubtedly a constant speed alternate current motor and a cheap mechanical speed changer would be the ideal solution if it stood the test. This, however, has not been done up to the present. The mechanical speed changers, based as they are, on friction, deteriorate rapidly, are bulky, occupying valuable floor space, are not as readily controlled as a variable speed motor, and cost pretty near as much if not more.

Mr. Wright said he feared poor workmen would prevent the advantages claimed for individual drive being realized. It is to be remembered that the advantages claimed are compared against a cone driving system at its maximum efficiency, and if on the one hand poor workmen would not get the best efficiency out of

individual drives, neither would they get best efficiency out of cone driven system, but with ten per cent steps, a step or two wrong would not be nearly so wasteful as one fifty per cent cone step wrong on a cone driven system.

President: Can we not hear from somebody else on this important question?

No response.

President: Gentlemen, I had occasion about two years ago to visit the General Electric Works at Schenectady, and while there noticed one of their largest planers at work driven by electricity. They had some kind of a controller on the machine in the way of a little hand wheel about four inches in diameter; by regulating it they could vary the speed on that machine from 12 feet to the minute to 20 feet a minute simply by turning this wheel. I don't know how it was arranged, but noticed its operation in that direction. It seems to be the general opinion of people who have installed electric plants that it is better to put an individual motor on large machines and group the small machines, run them by shafting which is driven by motors giving constant speed. In a great many instances they put motors on machines where the motor cost almost as much as the tool. I know of some lathes which cost about $300 and the motor attached cost $260. The speed controller attached to the motor cost $40 additional, making the motor cost $300, while the cost of the tool was only $300. I think for large planers, slotters, boring mills and all work that requires more than five horse power it might be well to drive by individual motor. It gives you the advantage of driving at any point in your shop, regardless of line shafting.

Mr. Stovel: Mr. President take the case you have quoted, namely a $300 motor on a $300 tool, if this tool keeps one man busy all the time, his wages will be about $700 a year. Now, if a motor on this tool will save ten per cent of the man's time this will mean a saving of $70 a year. How long will it take to pay for a $300 motor with $70 a year to do it?

Mr. Loetcher: Would you recommend individual driving in case where the nature of the work is such that the machinery can be grouped to advantage, say where work is very largely of

the same character, as for instance emery wheels and turret lathes?

Mr. Stovel: I hardly think we should class emery wheels as variable speed tools, but in regard to turret lathes, they are certainly variable speed tools and should have individual motors. Each operation has its definite proper cutting speed, and I have watched the operation of turret lathes equipped with variable speed motors, and seen the operator raise or lower the speed as the head swung around for the different operations thus saving time and money.

Mr. Simons: Is there any shop in the country where an individual motor is used on each machine in the shop?

President: The Bullock Electric Manufacturing Company at Cincinnati have all tools run by individual motors.

Mr. Stovel: The L. S. & M. S. are building new shops and have divided the machine tools into two classes, light and heavy. The heavy tools, namely a 28-inch lathe and heavier are being equipped with variable speed individual motors, while the light tools are being group driven.

Mr. J. A. Atwood: I would like to call attention to this fact, and I think we should not hessitate to apply the variable speed motor to individual tools so long as it is economical to do so. We should not hesitate to apply them to the smaller tools, I mean if we can demonstrate that it is economical to apply it to the smaller tools as well as the large ones.

President: Do any of the other gentlemen wish to say anything on this subject?

No response.

President: This closes the discussion and about winds up the business for to-day, but before adjourning I would like to announce the committee on resolutions on the death of Mr. French: I will name Mr. Watt, Mr. Turner and Mr. Simons.

Now, I would like to call your attention to the paper which will come up for discussion at the next meeting: "Elasticity in Draft Gear." That will be a very interesting subject, and it has been suggested that we might be able to secure a larger hall for our next meeting, and if we succeed in that direction you will all be notified by postal card.

ELASTICITY IN DRAFT GEAR.

BY MR. R. A. PARKE,
ENGINEERING DEPT. WESTINGHOUSE AIR BRAKE CO.

Notwithstanding the apparent simplicity of construction and operation of the ordinary draft gear upon railroad cars, its functions are not only complicated but they are also seriously obscured by the exceedingly short interval of time during which the operations usually last. The conditions under which draft gear is brought into operation are themselves diverse and complicated and investigation of the subject is therefore attended by many perplexities.

Without doubt, the primary purpose of what is now called the draft spring was to avoid, as far as possible, the blows and shocks which vehicles suffered in coming together to be united into trains; that is, it was simply a buffer spring. Owing to the difficulty of avoiding slack in car couplings and to the practical necessity of such slack for starting trains of considerable length, and because of the shocks in starting trains of vehicles between which such slack exists, it early became evident that a draft spring is also required. These two requirements have been separately met by different devices in some localities; but the spirit of ingenuity in developing the full practical utility of every resource has usually resulted in this country in the utilization of the same spring for both purposes, and the draft gear of to-day is so designed that a single appliance serves for both buffing and draft operations.

It was not until power brakes came into regular operation upon long freight trains that the varied character of the service required of draft gear became generally apparent; but a recognition of the complex demands upon draft gear long ago suggested serious doubt of the capability of the means usually employed to satisfactorily meet the requirements. These doubts, followed by patient study and experiment, have resulted in the production of a draft gear in which the customary spring has

been replaced by a mechanism in which friction furnishes the resistance to motion. It is with a view of considering some of the various demands upon a satisfactory draft gear and the character of the service rendered by the two forms of resistance utilized in these two types of draft gear, that the suggestions in this paper are presented.

The specific functions and purposes of draft gear must be determined from a clear understanding of the conditions under which it has to operate. This would appear, at first glance, to involve no great difficulty, as every operation which the device is apparently required to perform is for the purpose of preventing injurious impact, and it would thus seem sufficient to ascertain the maximum duty likely to be imposed upon it and to so provide sufficient resistance and movement to absorb the mechanical energy represented by the impact. Even if this view were a correct one, it is not easy to meet the requirements, because, first, it is very difficult to determine the maximum service that may properly be expected of the device, and second, whatever that maximum service is found to be, the movement which is permissible between cars, in the operation of the device, is so limited that the average resistance which must be employed is very difficult to attain by ordinary means. This will readily be appreciated from a simple illustration.

All sorts of combinations of cars are every day brought together, with varying degrees of force, in switching and making up trains in railroad yards. The simplest and least doubtful case of direct, simple impact is that in which a single car collides with another single car. Let us suppose the case, therefore, of a freight car, weighing 30,000 ℔, being switched, at a speed of 7 miles per hour, upon a track where it meets a similar car at rest. We know that, at the instant when the maximum pressure of the resulting impact occurs between the cars, both will be running at a speed of 3½ miles an hour and that the mechanical energy that disappears during the brief operation is about 24,600 foot pounds. The two cars are practically free from any effective outside influence during the operation of im-

pact, and the disappearance of this mechanical energy is necessarily attributable to the operation of the draft gear, which must absorb about 24,600 foot pounds of work, therefore, to prevent the injurious effects of direct impact upon the car structures. The permissible movement of the draft gear is limited to about 2½" upon each car, so that the cars may approach during the operation through a distance of only about 5-12 of a foot, and an average resistance of about 59,000 ℔ is necessary to effect the desired result. If a spring, or a combination of springs, be employed upon each car, for the purpose of providing this resistance, it is clearly necessary that it shall offer a final resistance of about 118,000 ℔, that the average resisting force shall be 59,000 lb. The use of a spring, or a combination of springs, which will offer so great a resistance through a compression of 2½ inches, is not an altogether simple solution of the problem.

It is unnecessary to enter into the question of the propriety of bringing cars together under such conditions as those stated in this example, or to consider whether such an example furnishes what may properly be considered limiting conditions in practice. It is sufficient to say that the conditions stated will be recognized as those met in everyday service, for which provision must be made in draft gear, if cars are not to suffer severe punishment. The difficulty of supplying springs to meet such a demand is obvious. The ordinary draft spring has a movement of about 1¾" and, when so compressed, offers a resistance of about 20,000 ℔. The mechanical energy that may be absorbed by two such springs, as they operate together in service, is about 2,900 foot pounds. Eight such springs at each end of each car would be insufficient to meet the requirements of the conditions of the case cited.

If, therefore, providing draft gear with sufficient movement and resistance to absorb the mechanical energy of impact between cars, were all that the case demands, it is not easy to meet the requirements by ordinary means; but such is far from being the case. We have followed the illustration of the impact between the two cars only to the point where, the pressure between them having reached a maximum, the two are moving at

a common speed of 3½ miles per hour. In every ordinary case of impact, the pressure between the colliding bodies regularly and gradually, though with great rapidity, increases from the instant of initial contact to a maximum, at which time the two, or at least the portions of their material near the surface of contact, are moving in unison. This operation is inevitably accompanied by compression and more or less distortion of form of the bodies. It is only possible for the two bodies to continue to move on with this common velocity when such distortion is permanent, or, in other words, when the compressed material is absolutely without elasticity. If the compressed material be elastic, immediately after the maximum pressure occurs, the material begins to return to its original form, with a corresponding decline of pressure, until the two bodies are wholly or partially restored to their original forms and are moving again at different speeds. If the compressed material, whether that of the cars themselves or of the draft gear between them, could be endowed with perfect elasticity, the two would finally separate with the switched car standing still and with the previously standing car now running at a speed of seven miles an hour. That is, they would simply have exchanged their velocities and their kinetic energies.

This is a matter for serious consideration under certain conditions of train operation. Of course no such thing as perfectly elastic or perfectly inelastic substances exist. Nearly complete absence of elasticity occurs in certain soft and insecurely bonded materials and in mechanisms in which mechanical energy is in some manner dissipated, and nearly complete elasticity is found in certain resilliant materials and in such mechanisms as springs constructed of such material, although a certain small amount of energy is always dissipated as heat through molecular friction, distortion and vibration. It thus occurs that nearly all mechanical energy absorbed by a spring is but temporarily stored until the conditions are such that it may be discharged in performing some kind of work. In the case of springs used in draft gear, that work can generally be perform-

ed only in causing motion. The effect of this characteristic is well illustrated in its relation to an emergency application of the brakes upon a long train.

The characteristic operation of the air brake in an emergency application is well understood. Notwithstanding the almost inconceivable rapidity of serial application of the brakes throughout a train, the small interval of time required permits the retardation to begin at the forward end of the train and to progressively multiply during the first two or three seconds, thus closing up the train, at first gradually but with increasing force toward the rear of the train. This force is sufficient to completely close the ordinary draft spring a few cars back of the forward end of an empty freight train and to close springs many times stronger at the rear end of such a train of but ordinary length. At speed as low as 20 miles an hour, the train comes to a stop before sufficient time has elapsed for the energy thus stored by the draft springs to become released; but at the higher speeds, the brakes having once become fully applied throughout the train, the force with which the cars are forced apart by even ordinary draft springs, is sufficient to almost certainly result in parting the train. In a series of air brake trials, 13 experimental emergency stops of an empty train of 50 practically new cars, were made from a speed of about 40 miles an hour, upon a level track, with the result that the train parted in twelve stops and in two different localities in two of the twelve.

While it is obviously of high importance that draft gear shall be provided with the capacity to absorb many times the mechanical energy of impact provided for by the ordinary draft spring, considerations of the character illustrated by the results of these emergency stops seem to as clearly indicate that the impact should be, as far as possible, inelastic. This conclusion is further emphasized by the fact that under similar conditions (and indeed under even much more trying conditions) it has been found practically impossible to part trains equipped with friction draft gear, which is yet capable of absorbing the 24,600 foot

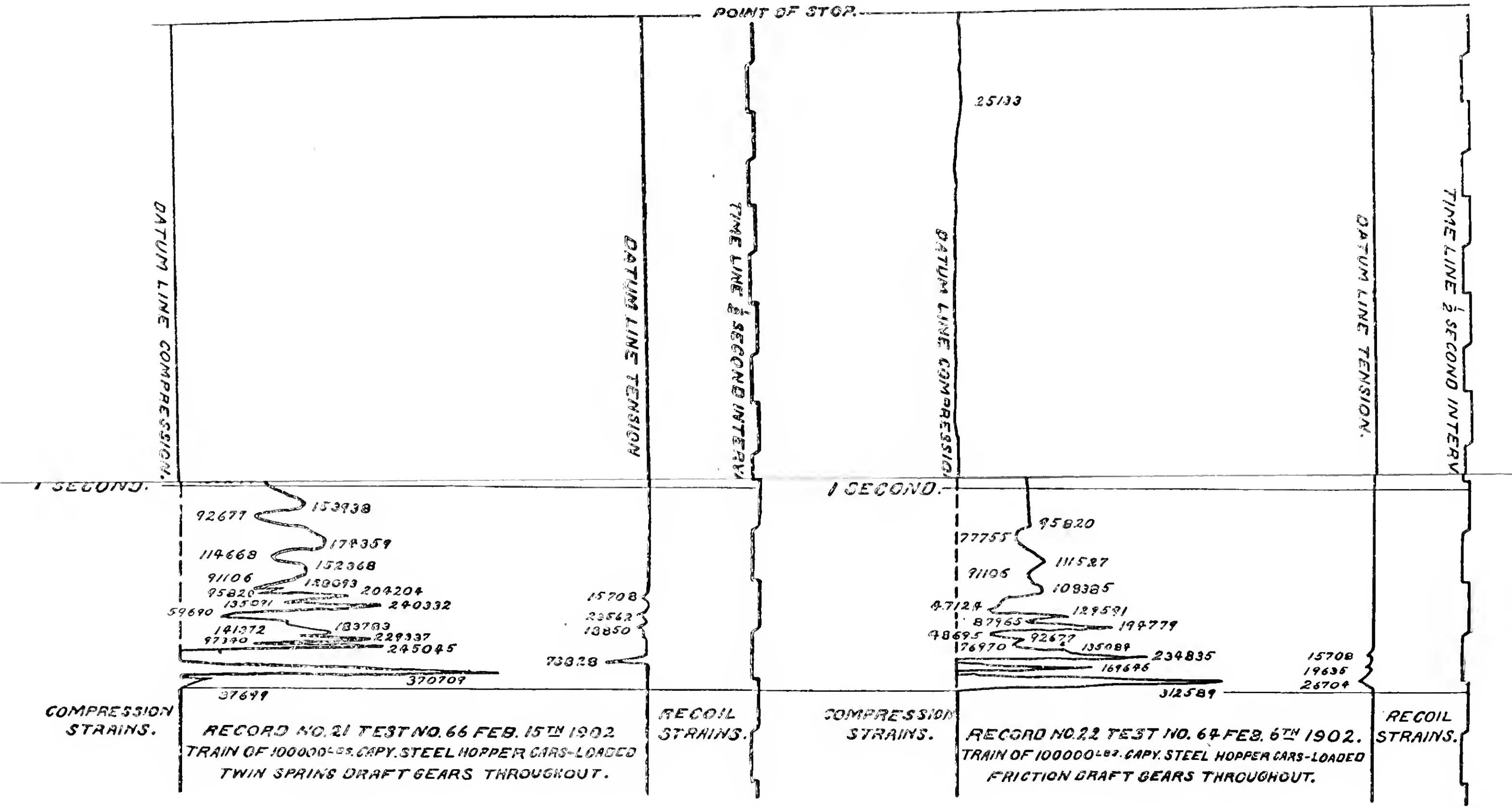
pounds of energy expended in the impact of the cars in our switching illustration.

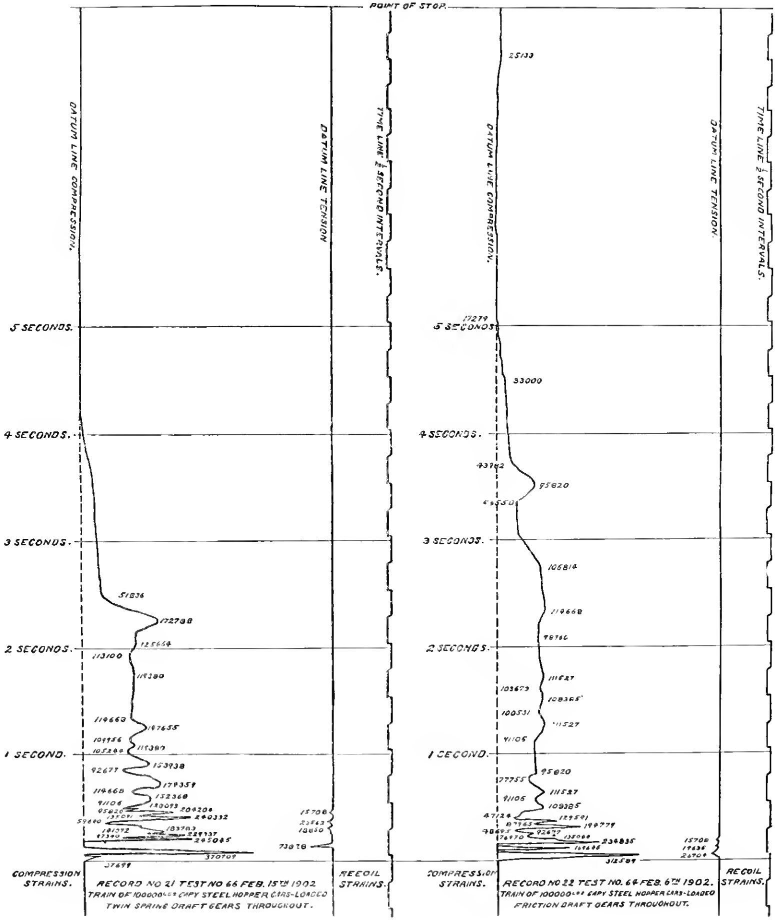
There is still another important influence of draft gear upon train operation to be considered, which is as yet very obscure and which is not easily brought within the range of actual determination or measurement. This is loss of mechanical energy through vibrations which the draft gear may or may not cause to extend through trains. The subject of impact is a most difficult one to treat and one of which our knowledge is very limited. The time occupied in its operations is so brief that the determination of the actual forces involved is, to say the least, extremely difficult, and we have generally been obliged to content ourselves with consideration of what is termed the impulse, or the measure of the momentum lost by one and gained by the other of the colliding bodies. These impulses are clearly defined in the treatment of such bodies as small spheres. But their determination becomes a complicated matter when bodies of irregular form and considerable mass are considered. The elasticity of materials involves the lapse of appreciable time in transmitting an impulse from the point of application to the more remote portions of the mass, and vibrations are thus instituted which very materially effect the simple results of impact, as customarily stated in text books. If a comparatively short prismatic body or bar come into endwise impact with another of the same cross-section and length, the ordinary laws of impact are rigorously applicable and the results of such impact may be definitely and concisely stated. If, however, the same short prismatic body come into endwise impact with another of the same cross-section but of several times greater length, the resulting impact is very greatly complicated through the effect of the vibration established in the longer bar. The latter is not only set in motion but, if elastic, like steel for instance, a longitudinal vibration back and forth throughout its length causes the motion at individual sections to occur in something like jumps. The rate at which the impulse travels through the bar depends upon the density and elasticity of the

material. The common statement that, if the bodies are perfectly elastic, the mechanical energy lost during the period of compression is wholly restored during the period of restitution, is applicable only to the small regular masses of geometrical figure ordinarily employed in physical experiments, and has no significance in the case of such impact as that occuring between assemblages of railroad cars. The diversion of the mechanical energy of impact through vibrations in the manner stated is well illustrated in considering the effect of the blow of a hammer upon a bell. The bell is so peculiarly shaped that a large portion of the mechanical energy of the falling hammer is converted into sonorous vibrations and thereby dissipated as heat.

Where a mass, made up of a number of separate masses with more or less elastic connections between them, comes into collision with a similar aggregation of elastically connected masses, such as is the case when a number of coupled cars come into contact with a number of other similarly coupled cars, the impact of the two masses cannot be considered as falling within the simple laws of ordinary impact. It is probably true that, if the rolling resistances could be eliminated, the changes in momentum of the centres of inertia of the two aggregations would be in accordance with the laws of impact, but the impact itself consists of a series of separate impacts between the vehicles, resulting in a series of vibrations through which disturbance continues for a very material period of time. What actually takes place may be described somewhat as follows:

First, the end cars of the two sections come into contact, through their draft gears. Each undergoes a change of velocity, that of the first section being retarded and that of the second section becoming accelerated, probably quite closely in accordance with the laws of impact of single and separate masses. Ignoring, for the moment, further action between these end cars of the two sections, each, because of its changed velocity, impinges, through the intervening draft gear, upon the second car of its section, in which each again undergoes a change of velocity. Thus, successively, the cars throughout


POINT OF STOP.
DATUM LINE COMPRESSION.
DATUM LINE TENSION
TIME LINE 1/2 SECOND INTERV
1 SECOND.
92677
153938
178359
114668
152368
91106
180093
204204
95820
135071
240332
59690
141372
183783
97390
229337
245045
370709
37699
15708
23562
13850
73828
COMPRESSION STRAINS.
RECORD NO. 21 TEST NO. 66 FEB. 15TH 1902
TRAIN OF 100000 LBS. CAPY. STEEL HOPPER CARS-LOADED
TWIN SPRING DRAFT GEARS THROUGHOUT.
RECOIL STRAINS.
25133
DATUM LINE COMPRESSION
DATUM LINE TENSION.
TIME LINE 1/2 SECOND INTERV
1 SECOND.
95820
77755
111587
91106
109385
47124
129591
87965
194779
48695
92677
76970
135084
234835
169696
312589
15708
19635
26704
COMPRESSION STRAINS.
RECORD NO. 22 TEST NO. 64 FEB. 6TH 1902.
TRAIN OF 100000 LBS. CAPY. STEEL HOPPER CARS-LOADED
FRICTION DRAFT GEARS THROUGHOUT.
RECOIL STRAINS.


POINT OF STOP.
DATUM LINE COMPRESSION.
DATUM LINE TENSION
TIME LINE ½ SECOND INTERVALS.
1 SECOND.
2 SECONDS.
3 SECONDS.
4 SECONDS.
5 SECONDS.
COMPRESSION STRAINS.
RECORD NO 21 TEST NO 66 FEB. 15TH 1902
TRAIN OF 100000 LBS CAPY STEEL HOPPER CARS-LOADED
TWIN SPRING DRAFT GEARS THROUGHOUT.
RECOIL STRAINS.
DATUM LINE COMPRESSION.
DATUM LINE TENSION.
TIME LINE ½ SECOND INTERVALS.
1 SECOND.
2 SECONDS.
3 SECONDS.
4 SECONDS.
5 SECONDS
COMPRESSION STRAINS.
RECORD NO 22 TEST NO. 64 FEB. 6TH 1902.
TRAIN OF 100000 LBS CAPY STEEL HOPPER CARS-LOADED
FRICTION DRAFT GEARS THROUGHOUT.
RECOIL STRAINS.

the moving section become affected by the retarded velocity of the first car, while the acquired velocity of the first car of the standing section is transmitted from car to car throughout that section. But, returning now to the first cars of the two sections, the impact between the first and second cars of each section results in a change of the velocity which resulted from the initial impact of the end cars, which causes them to react upon one another in a second impact, involving a new adjustment of their velocities, which, having been accomplished, is again transmitted from car to car throughout each section. This again results in another reaction upon the end cars of the two sections, causing a third impact between them, and so on, the single impact that would occur between two simple concentrated masses being replaced by a series of impacts vibrating throughout the two sections. Moreover, as the separate elemental masses, or cars, are not exactly alike, these vibrations are not uniform. Each of the separate reactions between each two cars of either section initiates an impulse. Some of these occur at such times and in such manner that they combine to form a compound impulse, while others so occur that they interfere and partially or wholly neutralize one another at some particular locality, so that the succession of impulses occuring at any particular point may vary greatly both with respect to regularity and intensity.

The character of these impulses must very largely depend upon the influence of the draft gear upon their propagation. It is manifest that their intensity will be best maintained by a medium which offers the least resistance to vibratory motion and will be diminished by a medium which, like a dashpot, is inimical to the propagation of vibration.

The character of the operation which has been thus crudely stated is illustrated in a very interesting manner by the accompanying cuts, which also serve to indicate, in some measure, the peculiar part which the draft gear plays in this complicated operation. These cuts are merely reproductions of diagrams taken from the recording apparatus of a dynamometer car, con-

structed especially for the purpose of recording the impulses transmitted through the draft gear of trains. The apparatus is so organized that the stresses upon the drawbar are recorded by pencils attached to movable arms, operated by the drawbar in such a manner that the force of the impulse is measured by the vertical movement of the pencils from horizontal datum lines, the apparatus having been calibrated under known conditions. The paper moves laterally toward the right, at a uniform speed, and serves simultaneously for four separate records. The upper line is made by a pencil operated by a clock circuit, by which the time is recorded in quarter second intervals. The next lower is the tension line, traced by a pencil which is secured to an arm that moves downward a distance proportional to the tension upon the drawbar. The third is the compression line, traced by a pencil attached to an arm which moves vertically upward a distance proportional to the pressure upon the drawbar. The fourth and lowest line is traced by a pencil operated through a circuit which is broken at each revolution of the axle and thus records the distance and, in combination with the time record, determines the speed. This line, being of no interest in connection with the purpose for which the diagrams are presented, has been omitted to economize space. The conditions under which these diagrams were taken are as follows: The dynamometer car was placed at the rear end of a train consisting of a locomotive and a number of loaded cars. The train was then backed and, at some speed, coupled to as many standing loaded cars as there were in the train, the dynamometer car being thus between the moving and standing loaded cars and registering the stresses upon the drawbar. The lower diagram is taken from a test in which the train consisted of the locomotive, tender and thirteen loaded, 100,000 lb capacity, steel hopper cars, each fitted with the twin-spring type of draft gear, followed by the dynamometer car. The thirteen loaded cars, together with the locomotive and dynamometer car, weighed 1077.8 tons. The thirteen stationary cars were of the same kind in all respects as those in the train and with load, weighed 661.

8 tons. The speed of the train, at the instant of coupling with the standing cars, was 4.71 miles an hour.

The upper diagram was taken from a test in which the train was composed of the same locomotive, tender, twenty loaded steel cars and dynamometer car, the loaded cars being of the same construction and capacity as those of the first test, except that all were equipped with the friction draft gear. This train weighed 1270.06 tons, and was coupled, while running at a speed of 5.18 miles an hour, to twenty standing cars of the same kind, equipped with friction draft gear and weighing, with their loads, 1103.55 tons. The diagram, in each case, records the stresses upon the drawbar of the dynamometer car from the time of initial impact until the trains came to a stop. For convenience of reference, the datum line of the pressure diagram has been extended below the line traced by the pencil and the more pronounced variations of pressure are indicated by figures obtained through measurement of the original diagram. It will be observed that the diagrams differ very materially in respect to the record of pressures upon the drawbar. They differ with respect to the intensity of the initial impact and with respect to the intensity, frequency and character of the later vibrations. If the colliding masses be regarded as single bodies in impact, the loss of mechanical energy at the instant of maximum pressure during the impact of the train with twin-spring draft gear, is 608,420 foot pounds. The loss of energy to the train with friction draft gear, at the corresponding instant, is 1,059,770 foot pounds, so that, under conditions of ordinary direct impact, the maximum pressure between the colliding bodies would be 74 per cent. greater for the train with friction draft gear than for the other. But, as already pointed out, and as clearly demonstrated by these diagrams, the two sections do not come together in any such impact, but, regardless of the number of cars in either section, the initial impact, is practically only that which would occur if two detached cars came together at the same speed.

The average weight of the loaded cars equipped with the

spring draft gear is determined from the thirteen standing cars to be 101,800 lb, and the average weight of those fitted with the friction draft gear is similarly found to be 110,350 lb. Regardless of the ultimate speed of the whole mass after the two sections are coupled together, that of two single loaded cars of the same weight, colliding with a relative speed of 4.71 miles an hour, would, at the instant of maximum pressure, be 2.355 miles an hour and the loss of mechanical energy, due to the impact, would, at that instant, be 37,760 foot pounds. Similarly the loss of energy of impact between two loaded cars of the train with friction draft gear, colliding at a relative speed of 5.18 miles an hour, is at the instant of maximum pressure 49,510 foot pounds. Whatever maximum pressure results from the impact in the first case, the conditions in the second case, except for the influence of different draft gear, should result in a maximum pressure about 31 per cent. greater. By referring to the diagrams, however, it will be seen that the maximum pressure of initial impact was 370,709 lb in the case where the train was fitted with the spring draft gear, while but 312,589 lb in the case where the cars were fitted with the friction draft gear, or but 60 per cent. of what should be expected if the two draft gears were equally effective.

The character of successive events, as indicated by the diagrams, is clearly defined and very interesting. In the case of the test with spring draft gear, it will be observed that, first of all, a pressure upon the drawbar of 37,699 lb occurred. This would seem to record the first operation of the spring draft gear between the cars coming into initial impact. The resistance of the draft gear being then exhausted, the direct impact between the cars resulted in the sudden increase of pressure to the maximum of 370,709 lb. The apparent drop of the pencil to the datum line between these two events is difficult to explain, more particularly as the corresponding operation, where the friction draft gear was used, is without any indication of the point at which the resistance of the draft gear became exhausted. Immediately after the initial impact, the diagrams show that the

drawbar suffered a tension, which, in the case of the spring draft gear, was 73,828 lb. while, with the friction draft gear, the tension was but 26,704 lb. Subsequent impacts were followed by similar tensions upon the drawbar, though of decreasing intensity, regular in character with the friction draft gear, though somewhat irregular in the case of the spring draft gear. These tensions, of course, mark the effect of the restoration of energy during the periods of restitution and clearly distinguish the difference in elasticities of impact in the two cases. The later impacts and the effects of superposition of impulses is very interestingly exhibited in both diagrams, the very material influence of the character of the draft gear upon the intensity and number of the vibrations being clearly shown. The notable differences in the chief characteristics of these diagrams are peculiar to the use of the two different types of draft gear, each being a representative diagram for the use of the type of draft gear employed in the train from which it was taken.

It will be observed that, in each of these diagrams, the maximum stresses upon the drawbars considerably exceed the limit of resistance which the draft gear is capable of withstanding; that is, the draft gears were exhausted and the car structures suffered more or less from direct impact. In the case of the spring draft gear, the maximum pressure appears to have been a considerable number of times greater, while in a case of the friction draft gear, it is about double the capacity provided. Had each draft gear been capable of offering a resistance sufficient to prevent direct impact, it seems quite certain that the total number of vibrations and the number and intensity of the tensions would have been multiplied, in the case of the spring draft gear, while they would have been correspondingly reduced with the friction draft gear.

A chiefly interesting effect of the vibrations thus set up throughout a train by impact is their influence in starting. In that case, the initial strain upon the drawbar is one of tension and, in intensity, it more nearly falls within the range of the resistance which the draft gear is capable of offering; in fact, it

falls well within the maximum capacity of the friction draft gear. In starting trains, the effective application of the force of the locomotive to the acceleration of the individual cars is very seriously disturbed by vibration. The avoidance of direct impact is of high importance but not more so than is the absence of vibration. Where vibration occurs, not only is the applied force partially expended in the dissipation of energy through such vibration, but, when various individual impulses become superposed, the combined result may wholly vitiate the effort and altogether prevent motion. This is readily verified by observation. It is frequently to be observed that, where heavy locomotives attempt to start long trains, the initial effort, apparently successful for a short distance, is suddenly met by a reactive impulse from the rear toward the forward end of the train, which results in an abrupt stop. On the other hand, of course, the contrary is also true. In some cases, an effort, promising at the outset, appears to be gradually overcome when the combination of individual impulses results in an accelerating impulse which, upon reaching the stalled locomotive, suddenly causes it to successfully start forward and get the train under headway. A total absence of vibrations of this character can hardly result otherwise than in enabling a locomotive to start a longer and heavier train than could occur where such vibrations accompany the locomotive effort. Vibration is inevitably inimical to the application of power and cannot exist except at the expense of energy. The complicated character of the diagrams illustrated seems to defy analysis or the determination of such definite characteristics as may lead to a clear knowledge of just what takes place throughout a train. But comparison of diagrams taken from the dynamometer car in different positions in the train, under conditions as nearly the same as possible, seems likely to furnish information of value in this respect. Those illustrated, however, seem to clearly warrant the conclusions already stated.

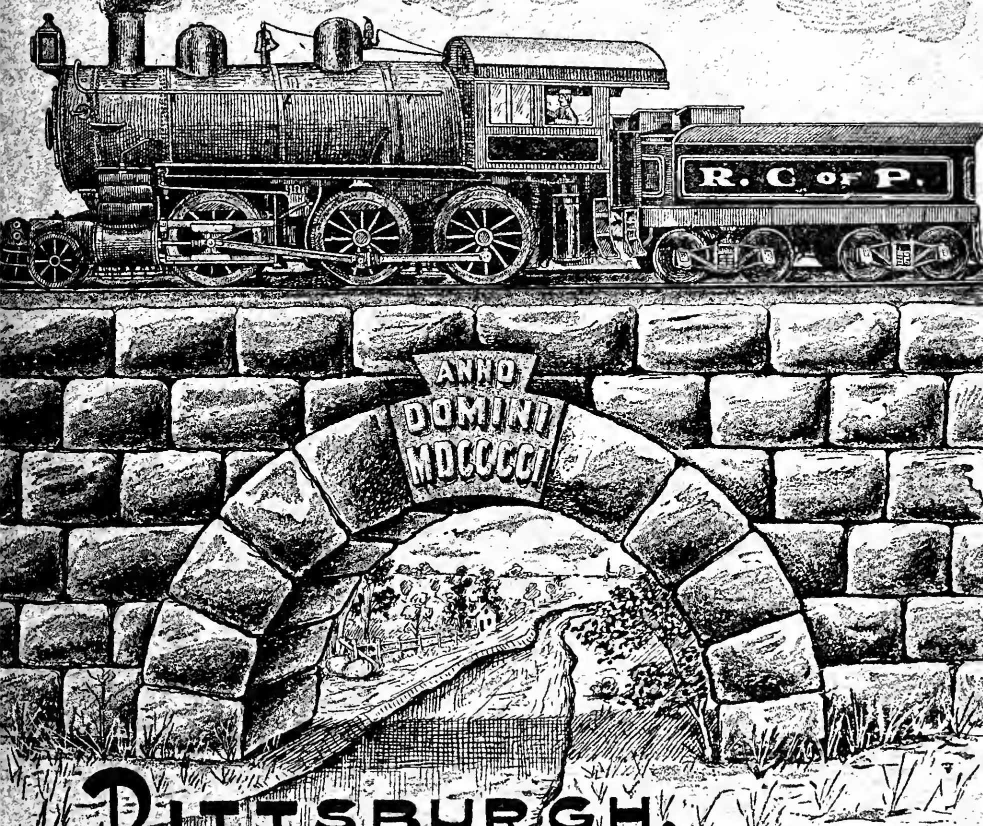
Mr. Secretary have you anything further to bring up before adjourning ?

Secretary: Gentlemen, inadvertently an error was made in our advance copy: "Elasticity in Draft Gear." The figures as they appear in the reproduction plate being reversed. This correction will be made however in our Journal when issued.

Upon motion meeting adjourned.

RAILWAY CLUB OF PITTSBURGH.

OFFICIAL PROCEEDINGS.



PITTSBURGH, PENNSYLVANIA.

APRIL 1902.

Classified Index of Advertisements

Index—Continued.

OFFICIAL PROCEEDINGS

of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

Vol. I. No. 6. **Pittsburgh, Pa., April 25, 1902.** $1.00 Per Year. 20c. per Copy.

Published monthly, except June, July and August, by the Railway Club of Pittsburgh, J. D. Conway, Secretary, General Offices P. & L. E. R. R., Pittsburgh, Pa.

Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, APRIL 25, 1902.

The meeting was called to order at two o'clock p. m., at the Hotel Henry, Pittsburgh, Pa., with President J. H. McConnell in the chair.

The following gentlemen registered:

MEMBERS.

Blackall, Robert H.	Mason, Stephen C.
Conway, J. D.	Miner, W. H.
Diamond, P. R.	McConnell, J. H.
Dow, George N.	McIlwain, J. D.
Evans, R. J.	McNulty, F. M.
Francis, John S.	Noble, D. C.
Gies, George E.	Redding, D. J.
Herr, E. M.	Shannon, Chas.
Holbrook, D. O.	Slocum, A. W.
Hukill, J L.	Turner, L. H.
Hyndman, F. T.	Watts, H. W.
Klingensmith, W. H.	Wendt, Edwin F.

Wright, R. V.

VISITORS.

Byers, Chas P.	Hyde, J. C.
Burke, John Jay	Parke, R. A.
Buhoup, H. C.	Pascault, C. O. D.
Creese, David C.	Richardson, W. P.
Gould, F. E.	Wright, W. P.

President: Gentlemen, the first order of business will be the announcement of new members by the Secretary.

Secretary: The following applications have been received and approved by the Executive Committee:

Mr. W. P. Richardson, Draftsman, P. & L. E. R. R. Co., Pittsburgh, Pa.

Mr. James Neal, of Brown & Co., Pittsburgh, Pa.

President: As these applications are approved by the Executive Committee, they are now members of the Railway Club of Pittsburgh.

President: Have you any reports of Committees, Mr. Secretary?

Secretary: Mr. President we have a committee on "New Quarters," the Executive Committee. They might have something to say on the subject of the change in quarters.

President: I can say for the information of the members that we called upon the proprietor of this hotel and he kindly offered us the use of this room, and further stated that at any

time we should desire larger quarters he would be glad to furnish it, and that he should be pleased to have us meet here as long as it suited our convenience. Hereafter all meetings of the club will be held at this hotel.

President: Have you any communications, Mr. Secretary?

Secretary: Read a number of communications, among them the following:

INTERSTATE COMMERCE COMMISSION.

OFFICE OF THE SECRETARY,

WASHINGTON.

April 15, 1902.

To the Secretary,
Railway Club of Pittsburgh,
Pittsburgh, Pa.

Dear Sir: Herewith please find report on Safety Appliances. The aim has been to make the table in the appendix of practical value by showing therein the most common defects in car equipment. I suggest that you bring the report to the attention of your association in order that discussion may draw out ideas or suggestions which will aid to the value of this table in future reports.

I shall be pleased to forward as many copies as you desire.

Very respectfully,

EDW. A. MOSELEY, Secretary.

CANADIAN RAILWAY CLUB.

MONTREAL.

April 5th, 1902.

Mr. J. D. Conway, Secretary
Railway Club of Pittsburgh,
Pittsburgh, Pa.

Dear Sir: I have been instructed by the officers of the Canadian Railway Club, (organized at Montreal on March 11th,) to convey to the officers and members of the Pittsburgh Railway Club, greetings, and to extend to them a hearty welcome to our meetings, which take place on the second Tuesday of each month

in the Windsor Hotel, Montreal, with the exception of the months of June, July and August.

Very truly yours,

M. P. KELLY, Secretary.

CHICAGO, April 22, 1902.

Mr. J. D. Conway, Secretary
Railway Club of Pittsburgh,
Pittsburgh, Pa.

Dear Sir: I find it impossible to be present at the meeting of the Pittsburgh Railway Club on Friday, the 25th inst., owing to some business matters that demands my presence in another direction, therefore, I would ask that the Club will kindly hear the discussion of my paper, which was presented at the February meeting, by those members who are prepared to discuss the paper, and if you will kindly forward to me the stenographer's notes, I should be very glad indeed to prepare an answer to the discussion as presented by our members.

Had I been able to carry out my wishes to be present in person, I should have asked that the club precede in the discussion of the paper, giving me the opportunity to conclude the discussion, in that necessarily what I may have to say further upon the subject, is necessarily dependent upon the points which should be developed by those who find anything in the paper to interest them.

I very much hope the members will take up the thing thoroughly, so that there may be developed all the information possible, for the mutual benefit of the members of our Club, and for the good of the railways at large.

Very truly yours,

IRA C. HUBBELL.

President: Gentlemen, under the head of "New Business" I think this club should take some action in regard to the courtesies extended us by the Hotel Lincoln in taking care of us so nicely during the fall and winter. It seems to me nothing more than right and proper, that the Secretary be instructed to write a letter to the proprietor of the Hotel Lincoln thanking him in behalf of this club for the courtesies extended.

Mr. McIlwain: I would make a motion to that effect, Mr. President.

Motion duly seconded and carried unanimously.

President: It is to be regretted that Mr. Hubbell cannot be present with us to-day, and also that he did not do what is customary under similar circumstances, write a letter to the club opening his own subject, and as we are without any information from him as to what he would say, Mr. Wright has kindly consented to take this matter up in a general way and present it to the club.

Mr. R. V. Wright: It is certainly unfortunate that our genial friend Mr. Hubbell, cannot be with us to-day to personally open the discussion on his valuable paper. He has been a close student of the question of economical steam distribution in the locomotive and in his paper before the St. Louis Club very clearly demonstated the advantages to be gained by decreasing the amount of cylinder clearance.

There is no question but what a very marked improvement can be made in economy, if it is possible to reduce the cylinder clearance from 7 or 8 to 2½ per cent and to so design the valve gear that it will harmonize. With the valve gear at present in general use we can not do this. The evil effects of reducing the clearance with the ordinary valve gear are clearly demonstrated by the excessive compression which results, are shown by Fig. No. 1, where the clearance is as low as 5 per cent.

The indicator card shown in Fig. No. 5 is certainly an extraordinary one for a locomotive. It might easily be mistaken for a Corliss engine card.

I take it from Mr. Hubbell's closing sentences that this card was taken from a locomotive fitted with a special valve gear, which can be successfully used with the extremely low clearance of 2½ per cent, and it would certainly be interesting if he could be present and go more into detail in regard to it.

To emphasize the importance of the matter of small cylinder clearance, I should like to read a few lines from Mr. Hubbell's paper before the St. Louis Club.

We do not generally appreciate the fact that the whole merit of a Corliss engine lies in the system of steam distribution, which not only comprehends and includes the valve movement, but the cylinder design as well, and which permits of a marked reduction

in the cylinder clearance as compared with other types of engines, but rather incline to entertain supernatural ideas and hold a sort of mystified conception as to just why it is that the Corliss engine up to the present time has been recognized as the most economical type of steam engine, attributing the marked economy largely to a question of low rotative speeds, forgetting that this slow movement is in itself the greatest enemy known to steam economy, in that it is manifest to all, the longer steam remains in contact with any body of a less temperature the greater the quantity of heat that passes from the steam to the adjacent body, and consequently the greater the loss of energy.

As just stated, the economy of the Corliss engines is due entirely to the reduction in cylinder clearance as compared with other designs of engines, and if, therefore, we can devise a valve movement which will enable a still greater reduction in cylinder clearance than is possible under the Corliss system of steam distribution, and which valve movement will also permit of higher rotative speeds, with relatively increased piston travel, it follows that we must necessarily secure an advanced economy over the well known type of Corliss engines.

President: Gentlemen, this paper is open for discussion.

Mr. E. M. Herr: I have just glanced over Mr. Hubbell's valuable and interesting paper and hardly feel that I have given it sufficient attention to intelligently cover it. The matter of low cylinder clearance is important. To get down to the minimum of that in locomotive practice would mean radical changes.

I am not familiar with the system of valve distribution which produced card which Mr. Hubbell shows on last page, Fig. 7. It is a valuable card viewed as an indicator card. It should be noted, however, that this card was produced at a speed of fifteen miles an hour. It would be interesting to see a card produced at fifty miles an hour, as the lower the speed the more perfect the card on any valve motion. A more careful examination of the paper discloses a card at high speed which is certainly admirable. Another thing I would like to have seen with indicator equipments was some coal and water performance of the engine. I have had some experience in adjusting valve motions and have sometimes found that the actual coal and water consumption was as bad with a good as a bad looking card. Of

course there are reasons why that is so, and those points are best brought out when we have not only the indicator to help us but also the coal and water consumption. I am speaking somewhat at random, gentlemen, and a more careful study of the paper would probably show that it has brought out some of the very points on which I am speaking, and I would be glad to give some one else a chance to discuss the matter.

President calls upon Col. Jones.

Col. D. P. Jones: Mr. President and gentlemen, I am afraid that any possible thing that I could say on this subject as information would be somewhat superficial. I am surprised to learn that an engine giving an abnormal card would seem to show as good working performance as one giving a good card. Abnormal cards are caused by abnormal workings of the engine, improper setting of valves, leaky pistons, etc., and I should think that a good card would show the proper working of the engine very thoroughly and emphasize the advantages thereof.

If an engine giving a bad card would show, in its working, as apparently good results as one giving a proper card, it would, to say the least, be very odd. Of course our friend has had personal experience and speaks by the card, and yet the statement would, it seems to me, bear qualifying.

As to the subject of clearance, I think very few engineers know what the commercial losses by clearance means. One of the foremost engineers of the period, Benjamin F. Isherwood, many years ago was the first to show the losses of economy due to this cause. He brought it out in a very beautiful way that was the wonder of the mathematicians of the period, for he had reduced the solution to a very simple arithmetical problem. Years ago I had some serious struggles with this question of clearance, and I trust that at some future time I can lay some of the results of my work before this Society.

Referring to a statement in the paper, if I heard correctly, I cannot see what the movements of the valve have to do with the amount of clearance. It is possibly because I am a little thick about it. Clearance is the amount of space between the valve seat and the piston when the piston is at the end of its stroke, and the loss by clearance is the amount of steam that fills this space without practically doing any work.

I dislike to speak on this subject without preparation, as I might say something that I would afterwards wish had been left unsaid. It is a very interesting subject indeed and I hope, at some future time, to speak upon it when I am better prepared.

President: Does any other gentleman wish to speak on this subject?

No response.

President: I don't know that I have anything to say except on the lines of what Mr. Herr spoke of. In the last issue of the Locomotive Engineering there was an account of a wonderful performance of a locomotive on one of the English roads that is going to show up great economy on fuel and water. This led the Engineering to comment on some of the parts taken from locomotives and regretted that there was none to be had from this one. It said it had seen very beautiful cards taken from locomotives almost perfect, but at the same time the engine was consuming an unusual amount of coal and water, and I think the article went on to say that a good card from a locomotive did not always indicate that it was doing good work.

Mr. E. M. Herr: I might add something more definite on my general statement, in justification of the position I took in the matter, I want to say that I don't want to be misunderstood, by having said that a distorted card is a good thing, a card indicating a distorted motion. The card I referred to was a card made by locomotive on large valve and portable. We found by substituting on another engine exactly like it with smaller valves while the card did not show the sharp corners, the engine did more economical and more satisfactory work.

Col. Jones: I think that argument is solid and I can now see the delusion that was bothering me for a few moments. That is a perfectly rational conclusion.

Mr. Ira C. Hubbell offers the following in connection with his paper:

The locomotive might be spoken of as a moving power plant utilizing the energy developed in its boiler directly in moving itself and freight and passengers from one place to another.

Conditions necessarily compress the maximum of output within the minimum of space, at least relatively, and each class of locomotives being properly designed for the particular con-

ditions. The development of the locomotive is an interesting and profitable study, and one naturally tending to make the student receptive to higher conditions of thought with corresponding advancement.

It is helpful to visit the Field Columbian Museum at Jackson Park, Chicago, and there read the thoughts of our ancestors in the evolution and growth of the locomotive, bearing in mind that its commencement is in a sense manifest first in the earliest means of transportation there exhibited, and as the man has appeared who was open to receive the higher and more advanced message of perfection voiced in the watch-word of progress, the manual labor attaching to the question of transportation of passengers and freight has decreased, and it is to be hoped that the chain of material manifestation of our advance from the latest locomotives now in the museum mentioned, may be completed by addition of later models, bringing the exhibit up to the present date.

Let us not overlook the fact that 1900 years ago, there appeared upon our earth a man whom all Christian nations honor and who left us a legacy to fulfill in the command, "Be ye therefore perfect, even as your Father which is in heaven is perfect," and I trust none will consider it irreverent to say that this command is not properly limited to a religious application, as we ordinarily apply and interpret the word "religious," but this demand is to all ages and all times and as to all things as related to man, and to us, therefore, comes the command to *perfect* the locomotive.

Willingness to give up stage coaches, and all the earlier means of travel, and gladness to accept the advanced conditions have brought us where we are.

In the February paper I have made the statement that in the paper before the New York Club in November last, "the points of advancement in the locomotive apparently emphasized, were the change in the details of the fire box, increasing the length of the boiler with longer tubes, application of piston valves and application of compound cylinders, or, in other words, compounding the engines; * * * but the record does not show that there has been after all such an advance in the locomotive since the early sixties, as shown by the two preceding illustra-

tions (see February Proceedings, pages 93 and 94) as one might expect."

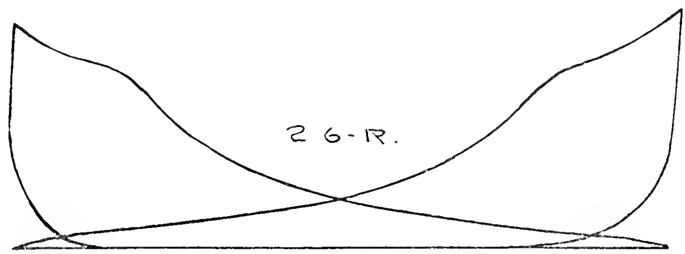
Our past advancement in the locomotive, therefore, seems to have been confined principally to the locomotive boiler, or in other words to the generating side of our moving power plant, and my hope, therefore, in the February paper was to develop a discussion of the engine side of our power plant comprised in the locomotive, and I regret that circumstances prevented my attendance at the April meeting to aid, so far as I might have been able, in provoking a wider discussion of this subject than seems to have been developed.

I am not insensible to the effort that has been expended in the direction of improving the steam distribution of the engines of the locomotive and it would appear that the lack of attaining has been largely due to the means adopted to accomplish the end.

The locomotive must necessarily be equally serviceable in forward and backward movements, as conditions demand, and to accomplish this nothing has been found so far better capable of accomplishing this result, than the Stephenson Link, and failure has attended all efforts to date to eliminate the link motion, and to answer the indirect question of Mr. Wright, I will say that cards 4, 5 and 7 are from a locomotive in daily operation, and of size and capacity as stated on page 99 of the February Proceedings, and is equipped with the regular link motion, eccentrics and blades, but has a slight addition to the valve movement which gives the steam distribution shown by the cards.

In answer to Mr. Herr I am pleased to say that whilst it is true that "The matter of low cylinder clearance is important," even in the locomotive, it is not true that to accomplish this involves "radical changes," for as just stated above, the locomotive from which diagrams 4, 5 and 7 were taken has the same eccentrics, links and blades as formerly, and the addition of simple parts, long service of which has demonstrated their durability, has enabled a redesign of their cylinders so as to reduce the cylinder clearance from 8 per cent to a fraction less than 2½ per cent, and without excessive compression resulting, as shown by diagram Fig. 4, page 96, of the February Proceedings, and which diagram is at very early cut-off and taken at a speed of 330 revolutions per minute, or at a speed of 80 miles per hour for 80 inch drivers.

In response to Mr. Herr's request for a diagram at 50 miles per hour, I present diagram 26R taken at 275 revolutions per minute or at a speed of 64 miles per hour with 78 inch drivers, or 50 miles per hour with 61 inch wheels.



In the matter of cold water consumption, I am not now able to supply the data asked for by Mr. Herr, but let me generally say that so far as can be said, the results are what might be expected from the diagrams presented, and are obtained through the elimination of unnatural resistance present in the locomotive of to-day, and as forcefully presented in diagrams 1 and 2 of the February paper where the steam used to propel the locomotive forward is early released from the cylinder and where the unnatural resistance of compression is set up early in the return stroke. absorbing momentum of the train and the power generated in the companion cylinder and necessarily resulting in the loss of power.

Our President—God bless him -- refers to comment in the in the Locomotive Engineering, regarding the reported performance of an English locomotive and concerning the comments mentioned as to the indicator cards I want to say that an indicator diagram is valueless unless accompanied by information as to the cylinder clearance, gauge pressure, size of cylinder, revolutions per minute, and spring number, and I therefore append this data as to cards, figures, 4, 5 and 7 of the February paper, and diagram 26R shown in this discussion. Cylinder 20 inch bore, 26 inch stroke. Cylinder clearance 2½ per cent. Drivers 61 in. diameter. Spring number 120.

Card No.	Location.	Grade.	Revs. per minute.	Speed Miles pr hr.	Boiler Press	Throttle.	Speed, Miles per hour for 78 in. Wheels.
16–R	17-30	41′	83	15	174	Full	19.3
18–R	18-25	28′	132	24	170	"	30.77
26–R	44-00	49′	275	50	160	"	64.
27–R	44-25	53′	330	60	160	"	76.7

Cards 26–R and 27–R were taken on down grades. Card 27–R is shown Fig. 4, 18–R Fig. 5 and 16–R Fig. 7 in the February paper.

Mr. Herr in explaining his earlier remarks about the good and bad cards but reiterates what I say in the February paper to effect "that no particular economy results from simply a straight steam line, nor does loss necessarily follow in the distribution where the steam line falls away from a line parallel to the atmospheric line." Economy in locomotive performance results from a system of steam distribution which increases the ratio of the mean effective pressure to the terminal pressure. In other words that system which requires the least number of cubic inches of steam per pound mean effective pressure and as a general proposition "square cornered cards" in themselves do not signify but indicator cards indicating free admission, a fairly well defined cut-off, exhaust only sufficiently early to clear the cylinder, compression retarded until its accumulation does not act as a serious retarding force upon the engine, with clearance low and proportioned to afford compression approaching well to the initial pressure, is irrevocably indicative of an economical engine and such an engine will show increased power over other engines of different steam distribution, will be quicker and give us the foundation for the compound locomotive of highest attainment.

President: Gentlemen, if there is no further discussion of this paper we will take up the next subject, the paper presented by Mr. Parke on the subject of "Elasticity in Draft Gear." Mr. Parke will you kindly open the discussion.

Mr. R. A. Parke: Rather than undertake to read this paper, I think I may save a little time by stating the substance of it and referring to it specifically in some places. The purpose of the paper is to deal, as the subject implies, with the character of the resistance in draft gear which is interposed to prevent injurious impact between vehicles. Of course, draft gear is designed primarily for that purpose. When two vehicles come to-

gether, a yielding or elastic connection between them saves injurious concussion, and its absence would cause them to be seriously injured and soon ruined. The purpose of any draft gear is to absorb the work of impact between the structures so that they may not suffer, or so that the injury from direct impact between the structures shall be reduced as much as possible. In order to clearly understand the effect of the different resistances in draft gear, it is necessary to understand exactly what takes place in the impact between two bodies. Two bodies, in coming together, begin to be compressed at the point of contact, the pressure increasing up to a time when they have reached a common speed. The pressure at that instant depends upon the difference in the relative initial speeds of the two bodies and upon the mass of the bodies. The bodies are distorted on account of this pressure, and they continue to be distorted up to the time when the maximum pressure occurs. When the maximum pressure is realized, if the materials of the masses be devoid of elasticity by which they can subsequently be restored to their initial forms, the bodies will continue to move on together after that at the same speed; while, on the other hand, if they are more or less elastic, from the instant when the maximum pressure occurs the elasticity causes the bodies to separate and to be restored wholly or partially to their original form, depending upon the degree of elasticity. Two bodies of such material as lead would remain permanently distorted, whereas bodies of such material as steel, unless the limit of elasticity is exceeded under the maximum pressure, would be wholly restored to their original forms and the slower moving body, that was overtaken by the body moving more rapidly, would in the end have the greater speed. This is an important feature to be considered in connection with draft gear. Primarily, the purpose of draft gear is to so absorb the work of the impact when the two bodies come together that the two cars shall not be injured and permanently distorted. Then the question arises as to what will take place after this work of impact has been taken up. If a spring is utilized for absorbing the work of the impact, we know it to be certain that sooner or later, that spring will return to its normal form, on account of its elastic character, and the cars will be separated again just as much as they were closed together during the impact. In other words, the cars will again separate and assume their

natural relations to one another, the springs being restored to their normal shape.

When two cars come together, the springs will always be more or less compressed. If the difference in speed is sufficiently great to represent work in excess of the resistance which the draft springs can offer, then, in spite of the work of the draft springs, it will result in an impact to the injury of the structures. I have given in the paper a simple example of two cars weighing each 30,000 pounds, one standing and the other switched upon it at a speed of 7 miles an hour. Under those conditions, at the instant when the cars come to a common speed, they will be both running at a speed of 3½ miles an hour and the amount of mechanical energy which must disappear during the interval between first coming into contact and running at the common speed is 24,600 foot pounds. The two cars are practically free from any effective outside influence during the operation of impact, and the disappearance of this mechanical energy is necessarily attributable to the operation of the draft gear, if effective, which must absorb about 24,600 foot pounds of work, therefore, to prevent the injurious effects of direct impact upon the car structures. The permissible movement of the draft gear is limited to about 2½ inches upon each car, so that the cars may approach during the operation through a distance of only about 5-12 of a foot, and an average resistance of about 59,000 pounds is necessary to effect the desired result.

That is simply a particular case; two empty cars, coming together at a difference of speed of seven miles an hour.

As I have stated, it is not necessary to enter into the question of the propriety of bringing the cars together at such a speed, or what should be the speed limit. It is a well known fact that such occurrences may be found every day. In such a case, the fact that, after the cars come to a common speed, the springs will recoil and force the cars apart, is not of much importance; but there are conditions under which this reaction of the springs, in returning to their normal form, is of serious consequence. It is a well known fact that, in the emergency application of the air brakes, the interval of time that elapses between the application of the brakes upon the head cars and the rear cars upon a long freight train is only about 2½ seconds. That interval is, how-

ever, sufficient to allow the effect of the brakes to become very firmly impressed upon the forward cars before affecting the rear cars, with the result that the train is closed up. The brakes of the forward cars, being applied first, begin to retard, at a very few cars from the locomotive, with sufficient force to close the ordinary draft spring, and, as that retardation increases toward the rear end of the train, the force at the rear end is sufficient to close springs many times stronger. At speeds of about twenty miles an hour or thereabouts, the train comes to a stop before the springs have had time to assert themselves and force the cars apart, after this closing up, resulting from the application of the brakes at the head end of the train first. But at the higher speeds of 30 or 40 miles an hour, the effect of the closed springs in forcing the cars apart, after the brakes have become applied firmly throughout the train, is so great as to almost inevitably break a train in two, at least an empty train, if it is as long as forty or fifty cars.

In a series of air-brake trials, thirteen experimental emergency stops of an empty train of fifty practically new cars, were made from a speed of about forty miles an hour, upon a level track, with the result that the train parted in twelve stops and in two different localities in two of the twelve. So that, while it is true that elasticity in draft gear may be unobjectionable in ordinary cases of cars coming together in yards, yet, in regular railway service, there are conditions, which occur every day, where the effect is not only undesirable but disastrous. Under similar conditions, it has been found that draft gear in which friction is used to provide the resistance necessary to prevent injurious impact of the cars, and from which there is comparatively small reaction, it was impossible to break the train in two.

Some little time ago the Westinghouse Air Brake Co. constructed a dynamometer car to study the effect of impact, and of all the operations of draft gear in regular train service. The car is provided with recording pencils, operated from the draw bar (to show the compression and also the tension that exists at any time upon the draw bar), up to a maximum limit of about 350,000 pounds. The apparatus is also provided with speed, distance and time recording appliances, so that the various

operations taking place can be recorded and studied. You will find two diagrams opposite page 8 of the paper, which were taken in this car during some experiments with both the twin spring and the friction draft gear. I wish to state here that, through an error, this diagram is upside down. The mistake occurred in lettering it. In reading the paper and the references to it, confusion will occur unless the error be explained. The diagram should have been printed the other side up, in order to conform to the description of it in the paper. (Note: diagram shown in the February Journal is corrected.—Editor.

Referring to it now as it stands on the page in the Advance Copy, the upper line represents compression, with the twin spring draft gear, the datum line being the line of no pressure. The distance that the pencil moves downward from that line indicates according to scale, the pressure, the more notable pressures being indicated by figures at the different points along the diagram. The second line is tension. It will be seen that very little tension occurred. The third line is time, in half second intervals. The fourth, fifth and sixth lines are similar records for the friction draft gear. The fourth line representing the compression, the fifth line tension and the sixth is time. These diagrams were obtained under the following conditions: Train was made up of a number of loaded, steel hopper-bottom gondolas of 100,-000 pounds capacity, the engine being at one end and the dynamometer car at the other. The engine and cars were backed into similarly loaded standing cars, being the same in number as the loads in the train. Each diagram represents what took place from the instant of initial contact, which is represented at the left hand side of the diagram, until the cars came to a stop. In the case of the diagram obtained from the cars which were fitted with the twin-spring type of draft gear, there were thirteen loaded moving cars and there were thirteen loaded standing cars. The train consisted of the locomotive, thirteen loaded cars and dynamometer car. In the case of the diagram from the cars having friction draft gear, the same locomotive, twenty loaded cars and the dynamometer car were backed into twenty loaded cars at rest. The loaded cars were of the same construction and capacity as those of the first test, except that all were equipped with the friction draft gear.

Now it will be observed that, with the twin spring draft gear, the train consisted of thirteen cars, and there were only thirteen standing cars, while, with the friction draft gear, there were twenty loaded cars and twenty standing cars. It might be supposed from that, as in ordinary impact of similar masses, that the force of the impact would be 20-13ths times as great with the heavier train than with the lighter train; but that is not I believe a proper way to look at the matter, for reasons which I have explained in the paper, and which are briefly these: The masses of the trains are made up of separately connected vehicles, and impact can only take place between two cars at a time; instead of a single impact, proportionate to the weight of the train, there occurs a series of impacts, the number of which should be greater the greater the length of the train, but the initial impact should be proportionate to the loaded weight of the individual cars and the square of the speed. The average loaded weight of the individual cars equipped with spring draft gear was 101,800 lbs., and the speed in the initial impact was 4.71 miles per hour, so that the mechanical energy due to that impact is 37,760 foot pounds. The average loaded weight of the cars with friction draft gear was 110,350 lbs., and the speed of collision was 5.18 miles per hour. The mechanical energy due to the initial impact is therefore 49,510 foot pounds, or 31 per cent. greater than was the case with the twin spring draft gear. If, therefore, the two kinds of draft gear were equally effective in absorbing this mechanical energy, the recorded maximum pressure of initial impact should be 31 per cent greater for the train with friction draft gear than for that with the spring draft gear. But the diagrams show that, while the maximum pressure of first impact with the twin spring gear train was 370,-709 lbs., that of first impact of the train with friction draft gear, instead of being 486,065 lbs. (31 per cent greater), was only 312,589 lbs., or 64 per cent of that pressure.

In other words, the friction draft gear reduced the force of impact to about 60 per cent of what it would have been if the spring draft gear had been in its place.

There are a number of other very interesting features also to be noted in connection with these diagrams. Because of that characteristic of elasticity in draft gear between vehicles, by

which, after compression has taken place, restoration to normal form and position necessarily follows, such an impact at one end is inevitably succeeded by a series of vibrations throughout the train. Even if there were no slack between the cars at all, the elasticity of the materials with which the cars are constructed must result in such a series of vibrations throughout the train, although they would hardly be measurable by ordinary means. It is certain that such vibrations throughout the train necessarily attend impact to an extent which is measured by the elasticity. It is very nicely illustrated by these diagrams. In the case of the twin spring diagram, there are thirteen separate impacts between the dynamometer car and the car into which it collided, which varied from 370,700 pounds at the beginning to a final of 172,700 pounds. The average of those thirteen impacts is 193,999 pounds. If we subtract from those impacts the force which the springs themselves were capable of absorbing (about 38,000 pounds), we still have left an average blow of about 156,000 pounds doing destructive work upon the car structures. Because there were twenty cars in the train in which friction draft gear was used, we should expect a proportionately greater number of vibrations than in the case where there were but thirteen cars; but with the friction draft gear, only ten corresponding impacts, of an average force of 154,000 pounds, occurred, against thirteen of 193,000 pounds on lighter cars, when spring draft gears were used. But if the force that is required to close up the friction draft gear (140,000 pounds) be deducted, there were but four of the ten that exceeded the effective operation of the draw bar and these direct impacts averaged 87,962 pounds. In other words, in the case of the spring draft gear there were thirteen blows destructive to the car body, averaging 156,000 pounds and aggregating 2,028,000 pounds, while, with the friction draft gear there were four such blows, averaging 87,962 pounds, and aggregating 351,850 pounds. Although there were twenty cars which should result in more blows, and the cars were more heavily loaded and collided at a higher rate of speed, when the friction draft gear was used, yet the destructive work done where the spring draft gear was employed upon only thirteen cars was 5.8 times as great.

Mr. John S. Francis, on being called upon responded as follows:

Mr. President and gentlemen—This article is entitled draft gear, but I cannot see that it is other than a draw bar attachment, or alleged improvement of spring arrangement. Anything in the yoke I always believed belongs to draw-bar attachment. This arrangement is called a friction draft, but it has springs in it to bring the draw back to its normal condition. It is doubtful if the draw bar would come back without those springs. Speaking of being impossible to take up the cushion to avoid destruction in fair usage or service without being destructive to the car, I think the whole problem can be reached in the ordinary springs, but the springs must be properly arranged. It is true that if there is only one spring, the spring soon loses its strength. Therefore when they put the twin springs in they compress the springs to insure their not compressing between the follower plates. I think that the spring arrangement is very simple, and it is not necessary to go outside their use. Mr. Parke speaks of the movement of the spring not compressing or having action of more than $1\frac{3}{4}$ inches. I have here a blue print showing a compression of $2\frac{3}{4}$ inches, giving the inside coil one inch more action than outside, by making it longer than the outside. When the blow is taken up it is graduated, the resistance being according to blow. It is said that the recoil would destroy the car. This claim was made when trouble arose where cars were equipped with what is known as the double pocket, springs used being combination tandem and twin.

The two forward springs were placed with yoke and the two back springs were stationary behind the yoke and were compressed $\frac{2}{3}$ of their action and were so arranged that when the car received a blow sufficient to compress the yoke springs $\frac{2}{3}$ of their action the recoil of back springs was so great that they broke the front end of the back lugs. I find there have been attempts made to modify that. I think the draw bar cushion can be overcome with springs as well as in the running gear, such as trucks under locomotives, by properly arranging the springs. There is a good deal of discussion as to what causes the destruction of cars. The fact is it is all done in the switching yards. Trainmen are blamed for a good many things which if looked at in their proper light they would not be exonerated, they are held responsible by the transporation department for the quick move-

ment of cars and not the breakage. Another thing I find very often, the couplers wont work and in order to insure their coupling crews soon learn to strike them hard. Consequently the road crew is blamed while the damage is done in the yards. As an illustration of this point I was watching some switching of heavily loaded cars which did not run in on the sidetrack to clear, due to side bearing not clearing. The crew was in a hurry and simply cornered the cars, which they did to save time. There were none of the mechanical department around and it was impossible to tell who did the damage. There are several things which need rearrangement in rolling stock outside of the draft gear itself, and a very important thing in that connection is side bearing clearing so as to give the crew an idea of how far the cars will run. Another thing the draft gear requires is uniform applications on large and small cars. I gave the question of draft gear considerable study in the last four or five years and I have come to the conclusion that the resistance can be overcome by ordinary springs with the proper application. However, you cannot depend upon ordinary spring arrangement as now applied. If two will not answer, enough should be added to avoid dead shock, in other words cars should have springs enough to take up all the shock. The diagram here is something I don't understand much about, but there is no doubt that the diagram pertaining to the steel cars would show a better card if the springs were rearranged. The heavy draw bar with heavy follower plates makes a heavy mass of metal to move, and when struck its own weight forms considerable item of resistance in itself, therefore the springs in draw bar in the present method of application should be modified, thereby increasing the travel of draw bar without lost motion. I think that if ordinary springs can be arranged under the trucks to give satisfaction, I am firm in the opinion that it can also be done in the draft gear ; therefore I cannot see any more necessity to go outside the usual springs in the draft than in the running gear.

Mr. H. C. Buhoup: The draft gear is something that interests me very much, and while not in the business, have listened with much interest to what Mr. Parke has stated concerning friction draft gear and Mr. Francis on spring draft gear.

It is a question of great importance and one deserving serious consideration. Mr. Francis speaks of springs arranged in the proper manner, but does not state what the proper manner is. If you put sufficient springs on to resist the impact of cars as handled to-day the resistance must be very great and the recoil increased correspondingly. Mr. Francis may have a method of applying springs to overcome this but fails to give it. I have given this subject a great deal of study myself and with due respect to the spring draft gear people, I believe that the solution of the question is friction with a reduced amount of spring compression.

In my opinion, more friction and less spring action give the best results both as so resistance and recoil. How to arrange springs only to get these results I fail to understand. If springs are placed in tandem they must have independently acting followers to get resistance. This cannot be obtained by one spring bearing on the other. No matter how many springs are applied in this way yon only get increased action—no increased resistance. I am not prepared, however, to speak fully on this subject at this time, but it is a subject on which a great deal can be said. The spring draft gear may be feasible but it is a question whether or not it can be worked out. I have not seen any yet that fills the requirements for heavy cars.

With friction you increase the resistance with a correspondingly decrease in recoil. It is my opinion that what we are coming to is friction, although there may be some method of applying springs only, and obtaining the results required, but it is beyond me. I thank you gentlemen.

Mr. H. W. Watts: Mr. Francis' remarks as to just what friction draft gear should be called, reminds me of a story, the moral of which is, that it does not make any difference what you call it, as long as it does the work.

After the first impact, there must be something to bring the coupler back to its normal position. Friction of course will not do this, but I take it, our friends making friction draft gear, are using only enough spring to bring the coupler back to its normal position. If, as Mr. Parke has said, the friction part of it takes up about ninety-two per cent of the impact, then it would seem that only eight per cent is expended in the recoil, by the springs,

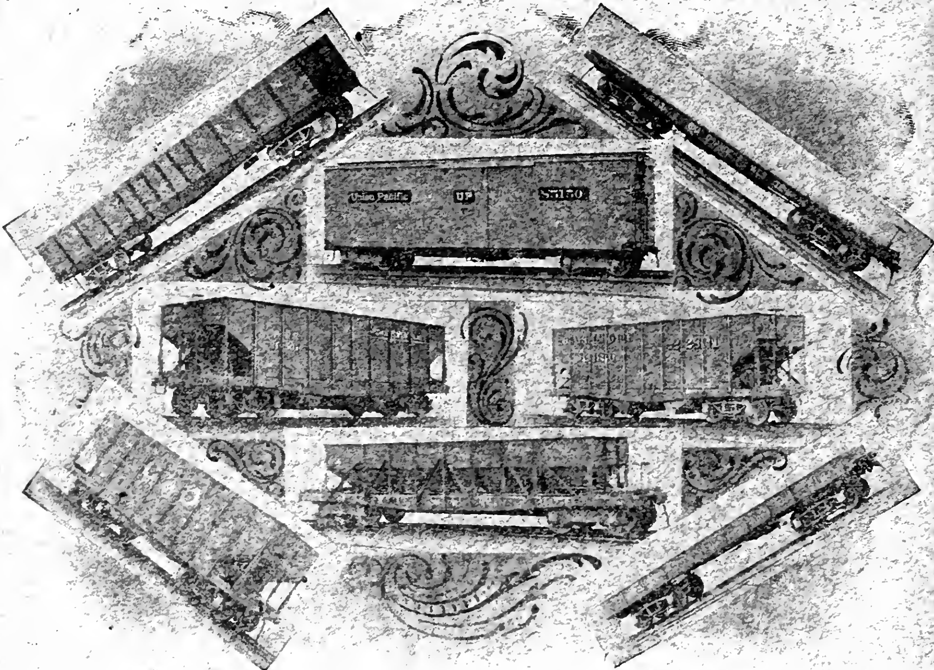
not enough to cause any damage, such as the parting of the train which has been the case when draft springs alone were used.

Mr. Parke: I would like to just say a few words in reply to two or three points which have been suggested. It is entirely true as has been stated, that springs are employed in the friction draft gear. Springs are employed for the initial purpose of inciting the friction by causing pressure between plates which will in their movement develop the friction which is relied upon to absorb the work of impact. To that extent, the springs exert a resistance, and to that extent only. The ultimate resistance of the ordinary friction draft gear is about 140,000 pounds. Of that resistance only about 16,000 pounds is due to the spring. In order to avoid recoil, those springs are so arranged that only 6000 or 7000 pounds is effective as recoil during release and return to normal position. In other words, about 140,000 pounds is available during impact, to avoid injury to the vehicle, with only about 6000 or 7000 pounds recoil; a very small percentage—three or four per cent.

It has also been suggested that the entire resistance necessary, can be insured by the use of springs. I think that need not be questioned. It is simply a matter of uniting the resistances of a sufficient number of sufficiently strong springs to attain the result; but it will be observed, by referring to the diagram of the twin spring cars in the paper, that the maximum pressure in initial impact was over 370,000 pounds. The maximum resistance of the twin springs was about 38,000, or only about ten per cent. In other words, it would require a spring arrangement affording nearly ten times as great resistance as presented by the twin springs in this case. Then moreover, by increasing the spring resistance, the recoil is correspondingly multiplied; and since it is true, as has been stated, that it is practically impossible to use the emergency brake upon a train of say fifty empty cars, running at a speed of 30 miles an hour, without causing the train to be parted, with draft springs of but 19,000 pounds resistance, it can be imagined what would be the result of the recoil from springs of 370,000 pounds resistance. All the evils of recoil and vibration throughout trains, which result from elasticity in the draft gear are multiplied as the spring power is increased to secure greater resistance to impact.

President: If there is nothing more to be said on this subject, gentlemen, we will consider it closed. This letter from the Secretary of the Inter-state Commerce Commission asking that we bring the preliminary report on safety appliances before this association with a view to having it discussed, after talking with the members of the Executive Committee, it was considered best that we take this up at the next meeting of the Club in May and have a general discussion of this subject previous to the meeting of the Master Car Builders Association in June. The Secretary will be supplied in a few days with a number of copies and anyone can have a copy by making application to him. I would suggest that you secure a copy of this, look it over and come to the next meeting prepared to take up this subject as asked by the Secretary of the Inter-state Commerce Commission.

There being no further business before the Club, upon motion, duly seconded and carried, meeting adjourned.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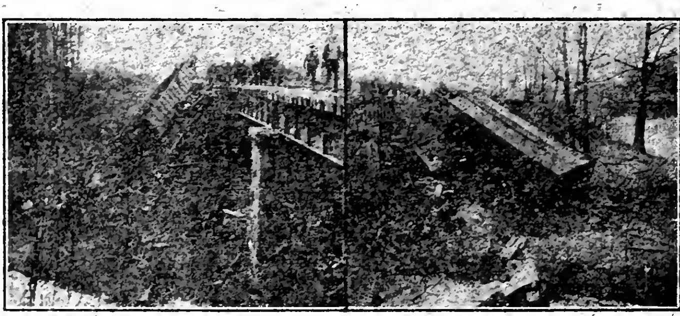

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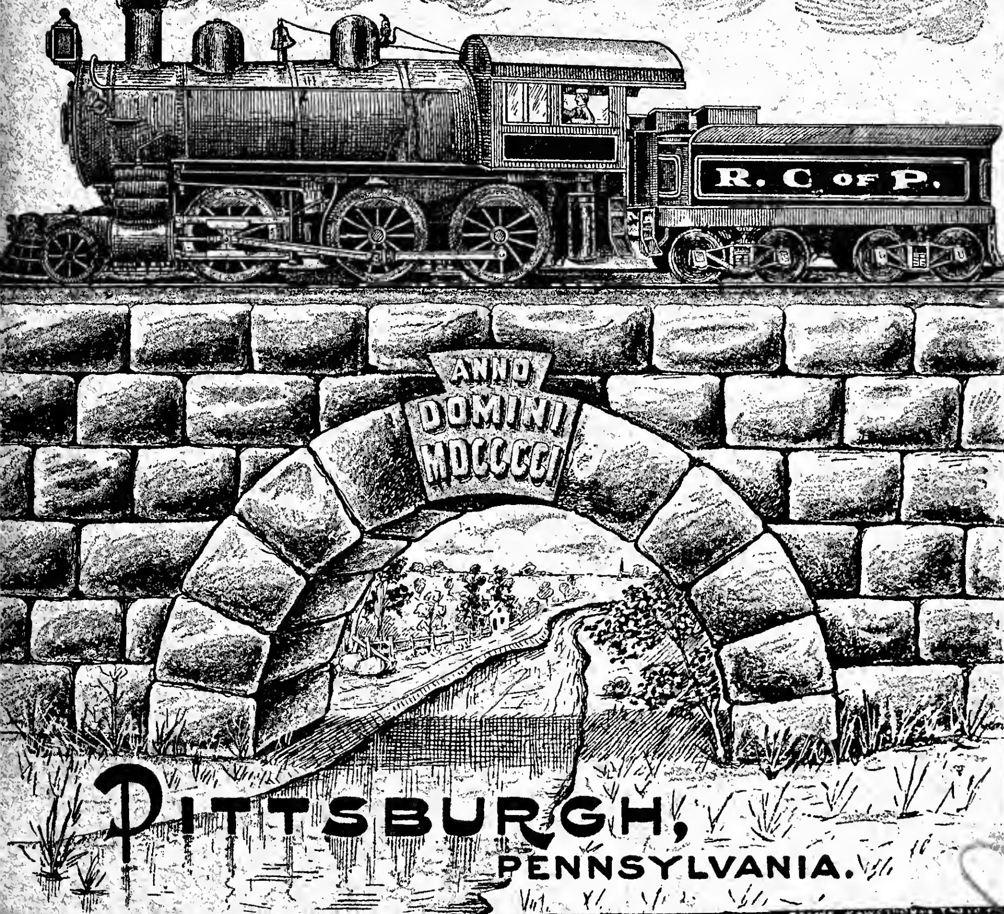

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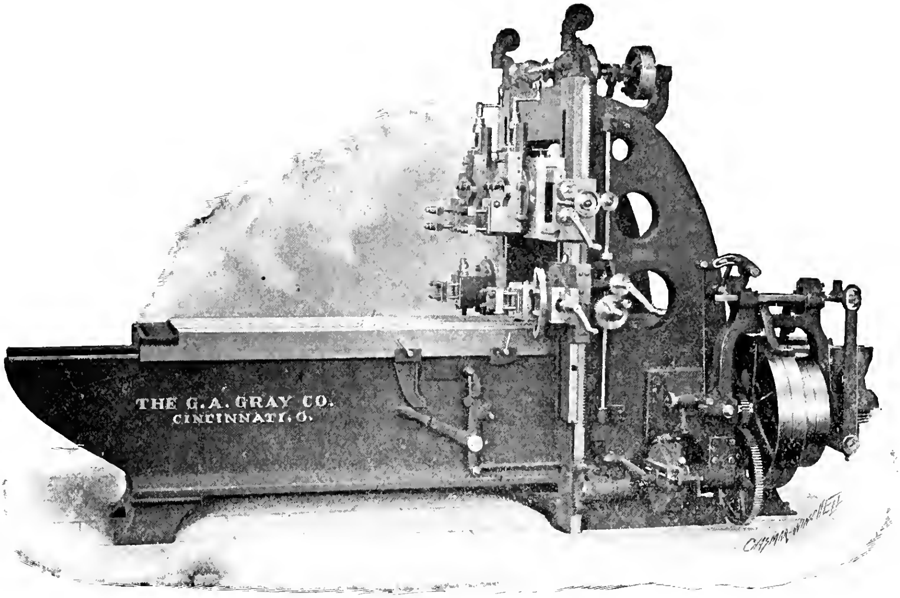
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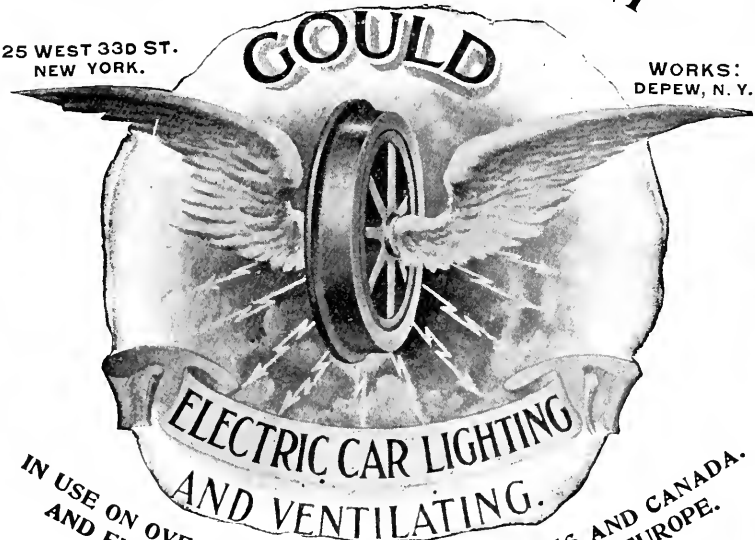

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Manufacturers of PAINTS, WHITE LEAD, COLORS and ACME CAR ROOFING MATERIAL.

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Classified Index of Advertisements

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OFFICIAL PROCEEDINGS

of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

OFFICERS, 1901 - 1902.

President,
J. H. McCONNELL,
Manager American Locomotive Co., Pittsburgh, Pa.

Vice-President,
L. H. TURNER,
*Supt. Motive Power, P. & L. E. R. R.
Pittsburgh, Pa.*

Treasurer,
J. D. McILWAIN,
*Sales Agent, J. D. McIlwain & Co.,
Pittsburgh, Pa.*

Secretary,
J. D. Conway,
Chief Clerk, Supt. M. P., General Offices P. & L. E. R. R., Pittsburgh, Pa.

Executive Committee,

D. F. CRAWFORD,
*Supt M. P. Penna. Lines West of Pgh.,
Ft. Wayne, Ind.*

J. E. SIMONS,
*S. of R S. & M., Pittsburgh Coal Co.,
Coraopolis, Pa.*

F. T. HYNDMAN,
*S. M. P., Bflo , Roch. & Pgh. R. R. Co.,
Du Bois, Pa.*

VOL. I.
NO. 7.

Pittsburgh, Pa., May 23, 1902.

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J. D. Conway, Secretary, General Offices P. & L. E. R. R., Pittsburgh, Pa.

Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING,
MAY 23, 1902.

The meeting was called to order at two o'clock p. m., at the Hotel Henry, Pittsburgh, Pa., with President J. H. McConnell in the chair.

The following gentlemen registered :

MEMBERS.

Bellows, A. B.
Courtney, D. C.
Conway, J. D.
Diamond, P. R.
Durrell, D. J.
Gies, Geo. E.
Hyndman, F. T.
Jones, Col. D. P.
McConnell, J. H.
McFeatters, F. R.
McIlwain, J. D.
McNulty, F. M.
Safford, J. B.
Simons, J. E.
Slocum, A. W.
Stark, B. F.
Sweeley, G. P.
Watts, H. W.

VISITORS.

Burke, Jno. J.
Hyde, J. C.
Howe, D. M.
Lindstrom, Chas. A.
Mendenhall, C. M.
Stevenson, Walter E.

President: We will open the meeting by asking the Secretary to read the list of new members.

Secretary Conway here read the announcement of new members as follows:

David M. Howe, Rep. Jos. Dixon Crucible Co., Lewis Block, Pittsburgh, Pa.

W. J. Courtney, Manager Peerless Rubber Mfg. Co., No. 16 Warren Street, New York.

C. S. Prosser, Asst. Manager Peerless Rubber Mfg. Co., No. 16 Warren Street, New York.

Chas. A. Lindstrom, Chief Engineer Pressed Steel Car Co., 1010 Western Ave., Allegheny, Pa.

President: Any reports of committees, Mr. Secretary?

Secretary: None, Mr. President.

President: Gentlemen, the Secretary has a communication which I think will interest all of you and we will be glad to have him read it.

Secretary here read communication as follows from Mr. M. J. Lennard:

SHARPSBURG, PA., May 8, 1902.

President Railway Club,

DEAR SIR: I have not the pleasure of a personal acquaintance with you, therefore I hope you will excuse me for addressing you in this manner, but I notice in this morning's paper that

the Railway Club is to have a meeting to discuss "Safety Appliances." Now, I have a safety appliance which I think would stop all discussion on this subject.

I enclose you a clipping of wreck from yesterday's Leader. This wreck would have been averted with my appliance, in fact it could not have happened, neither could the one on the B. & O. the other day, nor could the New York tunnel disaster have happened with my system. It has the endorsement of some of the high railroad officials of this vicinity, in fact it has the approval of all who have so far seen it. My system is practical also economical and it is utterly impossible to have a wreck under any circumstances, excepting only such wrecks as are caused by broken rails.

I have a working model in operation at my residence here in Sharpsburg. I would be pleased to show it to you and the other members of the club any time you designate. No doubt you hear of and see a lot of inventions which are no good at all, but do not place this one in this class.

I am engaged in business in Sharpsburg here, as is also my partner, and associated with us is one of the leading business men of Pittsburg. As practical railroad men, I would like to have you inspect it and I am sure that any and all of you will be pleased at having seen it.

Very respectfully,

M. J. LENNARD,

86 Main Street, Sharpsburg, Pa.

President: Gentlemen, what is your pleasure with reference to this communication?

A member: I move it be received and filed.

Motion seconded and carried.

President: Any unfinished business, Mr. Secretary?

Secretary: No unfinished business.

President: New business.

Mr. A. W. Slocum: Under the head of new business, Mr. President, a matter has been brought to my attention which I think is important. At the meeting of the Master Car Builders Association it is customary to have a meeting at the same time of the Secretaries of the different railway clubs. They meet there, get together, compare notes and get a great deal of valu-

able information for the use of their respective clubs. I know it has been of very great benefit, in my experience with several railway clubs. It has also been a good thing towards increasing the membership of the various clubs, and suggesting ideas for discussion at their meetings. I would therefore move, Mr. President that our Secretary be sent to this meeting at our expense.

President: I think that is a very valuable suggestion and hope that there will be a second to that motion.

A member: I second the motion.

Motion carried unanimously.

President: Gentlemen, this brings us up to the discussion of subject presented at the previous meeting.

It was the understanding at the last meeting that at this meeting we would take up the question of safety appliances, in accordance with letter sent us, by the Secretary of the Inter State Commerce Commission.

It seems we have a communication on this subject from Mr. Francis, and the Secretary will read Mr. Francis' letter and thus open the discussion. Secretary here read the communication as follows:

CONTRIBUTED.

"I am pleased to see the interest taken by the commission and now that they are doing good missionary work, they might go further.

In regard to damage to coupler, the statements of Mr. Harrihan (Ills. Cent., Page 278) Mr. Peck (Milwaukee & St. Paul, Page 279) and commission report (p. 72 2nd paragraph) it seems that the milk in the cocoanut is not sighted yet. The remedy to minimize this breakage of coupler is to give the draw bar more travel without lost motion by placing springs enough in yoke to take up all shock, keeping the draw bar in straight line and relieving the head from dead shock, against the car frame which results in spreading the coupler open and shearing the head off by the unequal strain upon the neck.

Of other safety appliances which no doubt will be considered of equal importance are as follows, Pedistal Trucks, having the cushion spread on the journals, reducing to a minimum the stress on the truck which is then interposed between the car and the cushion, reduces to a minimum the damage to wheels and rail-joints. The truck also when constructed should be trammed

and latterally braced to prevent chewing in order to overcome as much as possible the wear on flanges and rail heads.

Side bearing clearance. Bolsters should be of sufficient strength to maintain their position without deflecting, and roller or ball-bearings used to provide for the event of the load not balancing in the car. This defect reduced the loss of motive power wear on the flanges and rail heads.

Steel Tired Wheels under all equipment.

Metal Draft is of equal importance as metal trucks, bolsters or even wheels.

Brake rods should rest on rollers to overcome the resistance offered in setting brakes by hand, with the advent of power brakes there are so many rods and levers which require yard men to carry clubs in climbing cars with a lantern and stick, very often cars are allowed to strike without their being caught up. Also in this matter some arrangement should be provided to keep the brake shoes from dragging when brakes are released, which of course can be assisted by the rods traveling on rollers and leaves free from obstruction. All brakes should be hung on the truck and not from the car body.

Our western roads consider outside hung braked more efficient and economical for repairs, but in rounding sharp curves into factories and wharves, a little consideration will demonstrate I trust, that it is of doubtful policy to maintain brakes hung from the car frame.

Oil tanks should be installed to prevent longitudinal displacement. It is feared that pains enough are not taken to insure the head block fitting tight, the block may have good contact at the upper edge and is apt to be guessed at as to its fitting at the rim or barrel of tank, as the cylindrical part of the tank should take np the resistance and not the head. The size of the block is such that the shrinkage has a tendency to lessen the contact with the tank and any uneven surface on the block will soon pierce the head. The above mentioned longitudinal displacement is also assisted by the dead shock in the draft gear. This could be improved on by pouring fine cement or boiling tar between tank and head block, after the latter is thoroughly seasoned. The recent disaster on the Panhandle will I trust, make it apparent that this is a very important matter.

Yours truly,

JOHN S. FRANCIS.

President: Gentlemen, this subject is now open for discussion. Mr. Simons, can we not hear from you?

Mr. Simons: I do not know that I can say much on this subject, Mr. President, not having given the report any careful consideration, in fact I have only glanced over it since I came into this room. It occurs to me that the fact is very evident that the Inter State Commerce Commission propose to watch this question of safety appliances very carefully, and the statistics which they gather would indicate that they are watching this by inspection in various parts of the country and propose to assist the railway companies in every po-sible way by showing them what defects there are in their equipment. The statistics which they present also indicate that it is to the interest of the railway companies to keep those safety appliances in order. On page 63 you will notice in particular for the year ending June 30 that there is quite a decrease in the number of employes killed; in fact from 1898 when they numbered 209 it decreased in 1901 to 161 and about the same proportion as to those who were injured. Those are facts which speak for themselves. As regards the matter of keeping up those appliances, it is still a question in my mind whether we are all as careful as we should be, or as vigilant as we should be, in taking up with our men the importance of keeping those appliances in condition. I know in my own case that we have difficulties in some cases in keeping handholds on end sills. The hand holds are invariably left off. I know in one case last week I had to take this question up with one of our prominent railroads. The Inspector reported it to me with an acknowledgment that the railroad company did the work. But it was done at one of their remote shops where the employes probably di l not fully realize the importance of the attaching the hand hold to the sill. While it is true we pay out a great deal for the maintenance of certain kinds of appliances, I think the importance of keeping them in condition cannot be too strongly impressed upon our inspectors and repair men. I notice in connection with this report that there has been one case decided against the railway company where the car was not properly equipped with hand rails in accordance with the law, and the Judge instructed the jury to bring in a verdict for the plaintiff. That also indicates that the railroad companies can expect no favor from the Judges when they fail to comply with the law.

The question has also been raised as to whether a locomotive equipped with the common length draw bar is being considered as coming within the limits of the law. While there is no judicial opinion on that as far as I know, there is a belief in the minds of the Commission that it would come within the limit of the law. I have no doubt that there are many locomotives of such character in service to-day which are run under the impression—or the owners are under the impression—that as they are not engaged in Inter State commerce, or traffic, that they stand amenable to the law. I don't know that there is much more that I can say in connection with this subject, but I would like to hear from others. These are little matters that I gleaned in looking over the report.

Mr. H. W. Watts: As Mr. Simons says, there is no law compelling companies to place hand rails on locomotives. On page 67 you will notice the U. S. Circuit Court instructed the jury to return that a locomotive tender was not a car in the construction of the Act. However, every judge might not give binding instructions. The absence of an automatic coupler on a locomotive or tender would have its influence with the jury, and for that reason we have equipped our power with automatic couplers. I notice in Mr. Cochran's letter and some others here the point is made that it costs considerably more to keep up automatic couplers than it does the old pin and link couplers. I think that in making up those statistics the cost of keeping up pins and links has been lost sight of. The average life is nine months. I think there should also be taken into account the number of pins and links which would probably have been broken during that time. It is not fair to make a charge against the automatic couplers without giving them credit for breakage under the old system.

President McConnell here called upon Mr. McFeatters.

Mr. F. R. McFeatters: We have been using automatic couplers entirely on our engines.

With the heavy traffic we have had, we have had no experience with the pin and link. The cars and engines are all equipped with the automatic conplers.

Mr. J. D. McIlwain: Being practically out of railroad work I am nevertheless interested in everything that pertains to its improvement. I might recall an instance or two, simply to show

what we had to contend with in order to establish standards in the early days of the Master Car Builders Association. As far back as 1873 at Boston, when the Standard Axle was first introduced, I remember quite distinctly of several hot boxes that were generated in the discussion as to whether the Standard Axle should have 3¼x7 in. or 3¾x7 in. journals. The Pennsylvania interests favored 3¼x7, and the N. Y. C. and others, were for the larger journals, which won out after almost a split in the Association.

Again in 1887 at the Minneapolis convention the draw bar question was up. The hour that the committee made their report the convention hall was crowded as never before or since. The committee was on the fence, i. e., they were about equally divided between a vertical plane and a link pin coupler. When the report was before the convention for disposition, it was moved by Mr. E. B. Wall, now deceased, that the vertical plane type be the standard of the Association; this was seconded and adopted without discussion. The seconder made a statement that might have had some influence on the vote of the convention, viz., that it had come to his knowledge that the General Manager's Association had decided that if nothing was done by the Master Car Builders Association, at this meeting, that they would place the whole subject in the hands of a committee of experts, outside of the Master Car Builder's Association. This apparently, was a cloud burst on the meeting, and the motion of Mr. Wall prevailed. That was the keynote of the present style of coupler, to which, at that time, more than one-half of the Master Car Builder's Association were opposed.

It took three years to establish a standard for corner steps and grab irons on each corner of freight equipment. Do you know, Mr. President, that there are some cars running to-day, around Pittsburgh, with steps and grab irons on two corners of the car only.

To-day when making specifications for cars, one of the leading questions is, what improvements can be made to bettar insure the safety of trainmen? That is the proper spirit, and may it increase.

I am very much in favor of the work that is being done by the Interstate Commerce Commission, who have the subject of "Satety Appliances" in their hands. I also think their work

has done much towards uniformity in our standards, and the improvement in rolling stock—more power to them.

Mr. F. T. Hyndman: I have in mind a case where locomotives equipped with automatic couplers became uncoupled between the engine and tender and in some cases causing considerable damage to cars in the train and I think someone can find a wide field for improvement over couplers to be applied to tenders; It seems they become unlocked in some way without any apparent cause. You examine the couplers and find them in apparently good condition. I think it is a good point for the coupler people to work on.

Mr. G. E. Gies: Mr. President, I did not come to day prepared for anything on this subject, but what the gentleman has spoken of here is about what we have found. We know that the vertical plane coupler has made considerable improvement in railroads in handling cars, reducing the number of accidents and has facilitated the movements of trains. But I think there is still room for improvement in couplers. We have a great many broken couplers. Those used to-day are not what are required for the heavy work that is put on trains for heavy work and heavy engines. The guard appears to be too weak. That is not only one case but you find it more or less with all of them, couplers uncouple, and you come to examine them they apparently appear to be in good shape. As a comparison between the self coupler and the link and pin coupler that we had years ago, there is no question at all, and from the progress that has been made I have no doubt that in the future we will see improvements in the couplers that will do away with a great deal of breakage.

Mr. J. E. Simons: I think in a great many cases in connection with damage to couplers we ought to look further than the coupler itself. We all know that we were in a hurry to have cars equipped a few years ago in compliance with the Interstate Commerce law, and we hurried on couplers, regardless of construction of the draft, and as a result I believe that both the car body and the coupler are in consequence suffering to-day. Some of us have good heavy couplers, as good as can be gotten in the market applied to drafts which are not in any comparison as regards strength, and I can readily understand with the striking horn of the coupler, striking the face plate on the dead wood,

that we are sure to get broken couplers. I also think that some of the railroad companies are not following out the proper policies with reference to the handling of air brakes. I know that some companies are coupling up from 15 to 20 cars on the head end of the train, and we put in that train possibly 2400 ton of a load and maybe 85 or 90 empty cars, and I know the claim is made by some that the pump cannot supply the number, consequently they designate anywhere from 15, 18 or 20 cars. It occurs to me if those railroads would follow the lines of other roads and put on sufficient reservoir capacity on their locomotives they would be able to handle more air brake cars in their trains than they handle to-day. I believe that is one of the causes of broken couplers and broken cars. I do not think we are paying sufficient attention to the air brake equipment. I believe that we are not keeping it in the condition it should be kept, to do its work properly. I notice here in this summary of cars inspected by the Interstate Commerce inspectors that for the year ending June 30, 1901 they inspected 6894 cars. Something over 24 per cent. of them were found to be defective. Of course they take into account any minor defect which we might consider of minor importance, but it is a defect nevertheless. I believe we must pay more attention to our draft rigging before we can see the benefit from the vertical plane coupler, which I hope to see.

Mr. G. E. Gies: Maybe in this case, Mr. Chairman, it might be well to look into the reports of the Interstate Commerce Commission. In nearly nine cases out of every ten that the draw bar is reported defective when there is nothing but the cotter out of the coupler gone, but such small items as that will increase the number of defective parts of couplers, but I believe they have stricken that off the list of defects, not to be reported in the future.

There are quite a number of items like that in their report.

Mr. D. J. Durell: I expect, Mr. President, an apology is due from me for not attending the meetings during the past year. I hope another year I will be able to give my attention to the Pittsburgh Railway Club, and assure you it is a pleasure to be with you to-day.

President: Gentlemen, is there anything else to be said on this subject? If not we will take up the next subject.

Secretary: Mr. President and gentlemen, we have in our announcement for to-day a new subject, "The Car Record Office," by Mr. C. L. Gist, Superintendent of Transportation of the P. & L. E. R. R. This will be taken up at our September meeting. I hope we shall have a very good attendance at that meeting.

President: Gentlemen, at the meeting of the Society of Engineers for Western Pennsylvania, Col. Jones delivered an address on "Pittsburgh's contribution to our Naval Defences." The Colonel was persuaded to furnish us a number of copies of that address for our club and they are now here for distribution. The article is well worth reading. I think you will be all well pleased with it and hope that each one of you will take a copy before you leave.

Mr. J. E. Simons: Our position to-day it occurs to me presents the necessity of carrying out some lines different to what we have in vogue at the present time. We all came here to-day expecting to hear something with reference to this Interstate Commerce report. Don't you think it would be a wise policy in connection with papers of this kind to assign to somebody the duty of opening the discussion when the paper is sent them so that we will be able to take up matters of this kind more intelligently than we have been able to do in this case?

President: I think, Mr. Simons, that is a good suggestion and I think it would be well to assign the opening to some member of this Club. Usually the question is opened by the person who presents the paper, and the necessity of assigning the opening of the discussion to some one has probably not occurred before, but if a matter of this kind comes up again in the future we will ask the Secretary to see that some one is assigned to take care of the paper.

Secretary: We sometimes experience difficulty in getting subject matter for discussion. It has frequently occurred, that a subject is promised for a certain meeting and when it is almost too late to call on others, we are advised that the subject cannot be presented in time for that meeting. This necessarily causes more or less embarrassment to prepare for that meeting. We should get two or three subjects in advance if possible.

Mr. J. D. McIlwain: My experience in Railway Clubs is about the same as we have had here. To help the Secretary out

and make it more certain to have somebody present to open the discussion, it may be well to ask two or three persons instead of one. It is their duty to respond. If one is not prepared, perhaps the other one will be. I would not think it advisable to depend upon one man. That one man may be called away necessarily, while if we had two or three assigned to open the discussion we would be glad I am sure to hear them all if they were all present, and would suggest that instead of one we ask two or three in the future. We should be sure to get one out of three. Another point I want to make a little foreign to the question before us, however, is this: We as members in this club to-day should take a little more interest in the welfare of the club towards bringing in new members. In the Western Railway Club some ten years ago there was quite a revival. There were 150 members and they got in about 25 members at one meeting, and each member was asked to bring in a new member the next time he came in, and for the next six months they followed that plan. One man, the Superintendent of Motive Power of the C. M. & St. P., brought in about 25 members, made it his business that month to induce men to become members, and it is the same with many of you men all along the line. I think we should look for a little revival and at our next meeting in September we should be able to show results as we will have lots of time to work on. Bring in as many good working members as you can.

Mr. A. W. Slocum: There is one thing that has been followed by a great many railway clubs to arrouse interest of members and to induce them to bring in new members. One or two of them changed their meeting hour to noon. Many of the members are from out of town. They had it mapped out for the afternoon to visit some plant to illustrate the subject under discussion. Pittsburgh is especially equipped to produce plants of interest to railroad men, I know quite a few concerns who would be glad to open up their doors to this club. Our concern is disposed to do anything it can on these lines. I remember one trip which we made from Buffalo to Hamilton, Ohio. We made many trips to plants where we could talk over the process of making the article which we are discussing, or perhaps criticising. It would invariably bring beneficial results.

Mr. B. F. Stark: I would say in regard to membership, while we may not be able to come here at these meetings at all

times, we know when we get people here and they become interested in the subjects under discussion they become subscribers for the books and when they become members take an active interest in the discussion. If the books are brought to their attention they get knowledge which they could scarcely acquire if they were not members of the club.

Mr. Chas. A. Lindstrom: In the Western Railway Club, if any paper was not properly discussed, it was customary to make a motion to delay it to another meeting. I think we should further consider this subject, and discuss it at a later meeting. I wish someone would make a motion to take it up in the fall.

President. This question was brought up by a letter from the Secretary of the Inter State Commerce Commission; in view of the fact that the Master Car Builders Association meet in June at Saratoga, and it was his idea to get as much data as possible from the different railway clubs and bring it before the Master Car Builders Association so that if this matter were carried over until September the purpose of the discussion would have passed by.

Now, gentlemen, there has been a good deal said about an increase in membership of this club. I am informed by the Secretary that we have now a membership of something like 265 members, and it seems to me that is a pretty good start for an Association only five or six months old, and it is evident that the members of this club have been at work gathering in new members. In regard to the Secretary's remarks with refierence to the subjects under discussion, the matter is going to be brought to the attention of the Executive Committee during the vacation with a view of having at least two or three subjects ahead at all times for discussion at the club meetings. We have had the promise of a number of very interesting articles from several members of this club, and it is to be hoped that when we meet again in September we will have three subjects to choose from in addition to the one we already have assigned, and we feel confident this will relieve the Secretary of quite an onerous burden. There is one difficulty about the meeting of the Executive Committee and that is this: Two members of the Committee live out of town and the other two are out of town a good deal, and when we want a meeting it frequently happens that there is only one member here. That of course cannot be helped, but

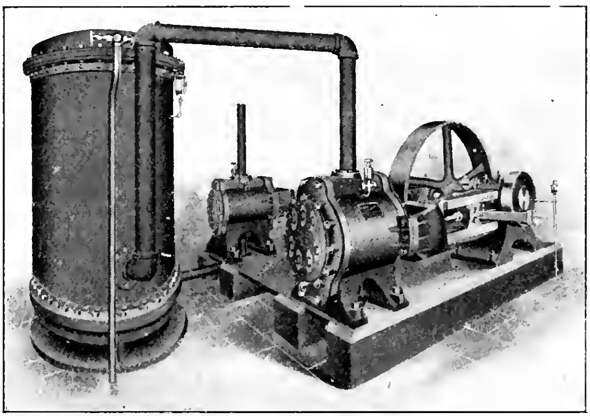
during the summer I think we can provide material that will help us along through the fall and we will have no difficulty in having subjects for discussion thereafter.

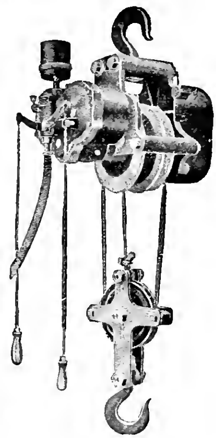
Mr. Simons: There was one little matter brought up in connection with the remarks, and which I think has been followed in the club here, and that is the question of having the member read the paper, or who had a paper before the meeting open the discussion. It is a question in my mind whether it is wisdom to do that. It is naturally to be supposed that the member has the meat of the subject in hand, and his discussion is going to be opened on a line with the paper itself. I for one would assign the opening of the subject to some other member to be named by the President with the understanding that he would take the paper and open the discussion at the next meeting. I believe in that way we would get better results.

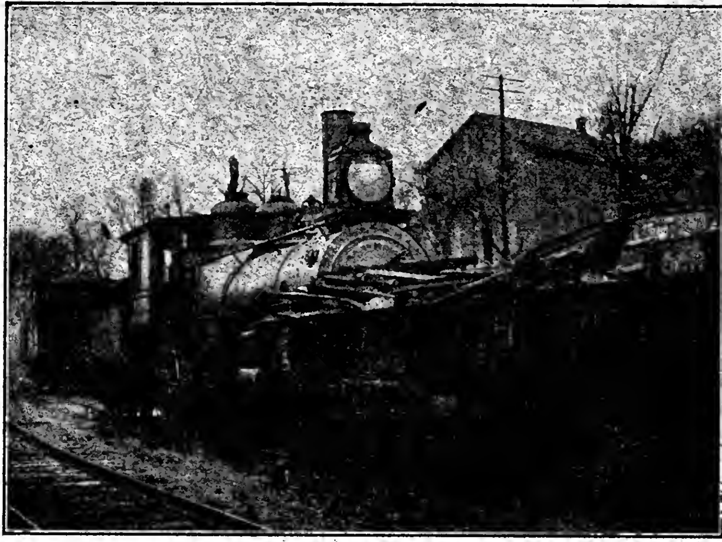
Mr. H. W. Watts: I heartily agree with Mr. Simons in what he says, when a man has carefully and exhaustively prepared a paper I think it is a burden upon him to in addition to that, to open the discussion of the subject, especially in view of the fact that he is expected to give new matter. It is too much to ask, and I believe as Mr. Simons has said it would add much of interest if that burden were placed upon others than those who prepare the papers.

Mr. J. D. McIlwain: It was the custom in a Western Club that the writer of the paper had the opportunity of closing the discussion. During the discussion he would run up against a good many points and would like to have something to say in retalliation. We have had some most interesting meetings in that way. The Association, or the talking members of it, were up against him and were ready to fire questions and the writer of the paper must be prepared to answer, and it was naturally very interesting to hear the discussion. I am sure it would be a good plan for us to adopt.

Upon motion meeting adjourned.

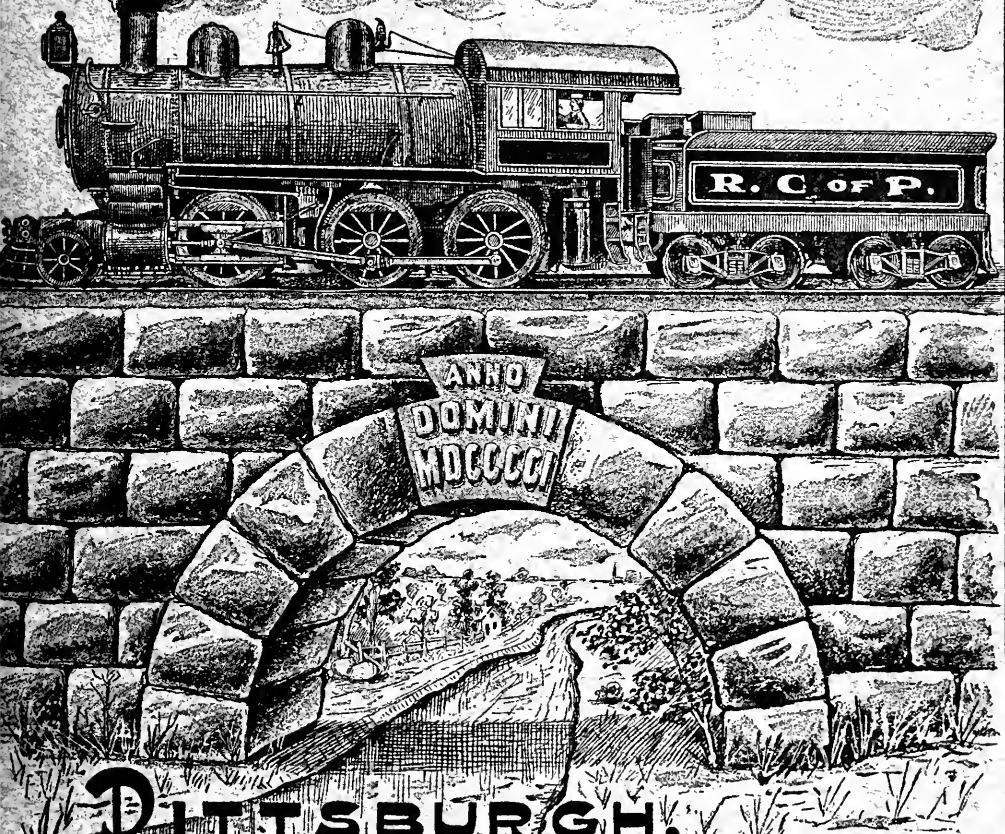






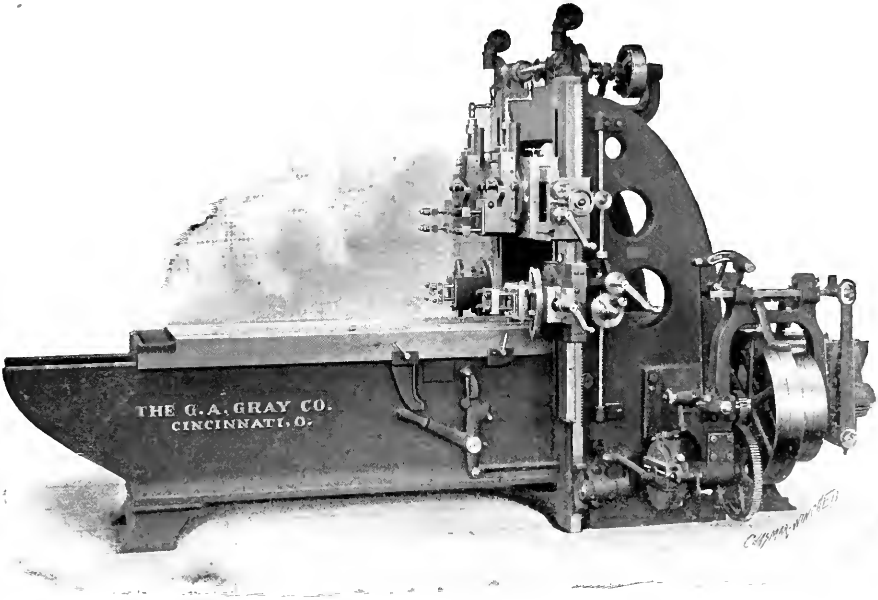
RAILWAY CLUB OF PITTSBURGH.

OFFICIAL PROCEEDINGS.



PITTSBURGH, PENNSYLVANIA.

SEPTEMBER 1902.


THE G. A. GRAY CO.
CINCINNATI, O.

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Treasurer Fox Foundry and Machine Co.,
310 Frick Building, Pittsburgh.

F. T. HYNDMAN,
S. M. P., Bflo, Roch. & Pgh. R. R. Co.,
Du Bois, Pa.

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, SEPTEMBER 26, 1902.

The meeting was called to order at two o'clock p. m., at the Hotel Henry, Pittsburgh, Pa., with President J. H. McConnell in the chair.

The following gentlemen registered :

MEMBERS.

Ames, G. F.	McConnell, J. H.
Blackall, Robt. H.	McIlwain, J. D.
Carson, G. E.	McKee, S. Frank
Conway, J. D.	Rhodes, Geo. P.
Diamond, P. R.	Safford, J. B.
Gies, Geo. E.	Slocum, Chas. V.
Gist, C. L.	Slocum, A. W.
Huntley, F. P.	Sweeley, G. P.
Hunter, H. S.	Turner, L. H.
Hussey, Jno. U.	Watts, H. W.
Hyndman, F. T.	Wendt, Edwin F.
Hyndman, N. P	Weisbrod, J. F.
Jackson, Thos.	Whitney, L. B.
Johnson, Wm. T.	Wilson, Hugh M.

Wright, Wm.

VISITORS.

Buckley, J. T.	Maury, Geo. P.
Donovan, P. J.	Newell, W. E.
Greenick, A. A.	O'Toole, J. L.
Groenlie, F. A.	Simmons, W. M.
Hyde, J. C.	Stark, F. H.

The list of applicants for membership was read by Secretary J. D. Conway, as follows :

J. S. Bays, Manager Wycoff, Seamans & Benedict, No. 428 Wood street, Pittsburgh, Pa.

J. W. Alexander, Representing Standard Railway Equipment Co., No. 404 Park building, Pittsburgh, Pa.

Geo. P. Maury, Manager Metallurgical Laboratory, of Pittsburgh.

W. N. Thornburgh, Manager and Treasurer Thornburgh Coupler Attachment Co , Limited, 1014 Majestic building, Detroit.

W. M. Simmons, Western Manager Railway Review and Engineering, No. 306 Frick building, Pittsburgh, Pa.

Willard A. Smith, President Railway Review and Engineering, Manhattan building, Chicago, Ill.

A. Greenick, Draftsman, General Office, P. & L. E. R. R. Co., Pittsburgh, Pa.

B. A. Ludgate, Draftsman, General Office, P. & L. E. R. R. Co., Pittsburgh, Pa.

A. B. Johnson, Engineering Salesman Pressed Steel Car Co., Tradesmens building, Pittsburgh, Pa.

Egbert H. Gold, Car Heating Apparatus, 262-3 Monadnock block, Chicago, Ill.

J. T. Buckley, Representing Jenkins Bros., 133 N. Seventh street, Philadelphia, Pa.

W. F. Wendt, C. C. to General Superintendent M. C. Ry. Co., Pittsburgh, Pa.

F. H. Stark, Superintendent R. S. Pittsburgh Coal Co., Coraopolis, Pa.

J. L. O'Toole, Car Accountant Pittsburgh Coal Co., No. 232 Fifth avenue, Pittsburgh, Pa.

J. F. Prendergast, M. M., B. & O. R. R. Co., Glenwood, Pa.

The President announced that these names had all been passed upon and accepted by the Executive Committee, and therefore declared them members of the Club.

Under head of "Reports of Committees," Secretary Conway reported that he had attended the recent convention of the Railway Club Secretaries of the United States, at Saratoga, held in connection with conventions of the Associations of Master Car Builders and Master Mechanics, and that a detailed report would be printed with the proceedings of this meeting.

The Secretary reported that, as at the last meeting, after some discussion, the duty of appointing persons to open the discussion of the papers was by the President, with common consent, imposed upon him, he had notified four gentlemen that they were appointed to open the discussion at this meeting, Messrs. W. A. Terry, Assistant General Freight Agent, P. & L. E. R. R.; Mr. H. W. Watts, M. C. B. of the Monongahela Connecting R. R.; Mr. O. J. Hammond, G. F. A. of the Bessemer R. R., and Mr. Frank McCune, General Superintendent of the M. C. R. R. With the exception of one, Mr. Watts, who is present, the rest of the gentlemen were compelled to refuse on account of pressing business, or of being out of town.

The Secretary read a communication from the Mueller Simplex Locomotive Cab Signal Co., which was ordered by the President to be filed.

President: Under the head of "New Business" it might be proper at this time to bring up the question of the next meeting of this Club, which will be the annual meeting and the election of officers. It has been suggested that the meeting be held in the evening, and that we make an effort to get out as many of our members as possible and make a social time of it. I understand some members of the Club have a motion to make on that subject.

On motion of Mr. J. D. McIlwain it is ordered that the next meeting, being the annual meeting, a smoker be held, with all the accessories, and that a committee of five to act in conjunction with the Executive Committee be appointed to make the necessary arrangements.

On motion of Mr. C. V. Slocum the Chair is requested to appoint that Committee.

The Chair appoints as the five members of that Committee to act with the Executive Committee, Messrs. J. D. McIlwain, Robert A. Bole, John T. Brown, Edwin M. Herr and J. L. Hukill.

THE CAR RECORD OFFICE.

BY C. L. GIST, SUP'T. TRANSPORTATION, P. & L. E. R. R. CO.

It is only within recent years that the value of this office has been recognized. In fact on a few roads even today it is merely a subordinate in the Auditing department of the company, its duties being confined to computing mileage and other little matters incidental to the Transportation department. Between the time this article is being written and the time it will be read before the Railway Club, of Pittsburg, we expect that the per diem system of paying rent on foreign cars will be in operation. This will change some of the work now being done and add much more work to the record office. It is not the purpose of this article to discuss per diem, which to most of us is

only a theory at this time, but I can not refrain from saying we do not expect it to cure all the ills the freight car is heir to. The condition of the freight car patient is low, and as a last resort to revive it, heroic measures are necessary, therefore, the American Railway Association recommended per diem and it is to be hoped most of the roads will at least give it a trial. There is no doubt that it will cost short roads more money, but if it accelerates the freight car movement, the line will gain in the end.

The distribution and control of all cars should be under the direct supervision of the person in charge of car records. Having the records constantly at hand and knowing exactly where all cars are and the proper home routing of them and improper uses to which they are put are at once brought to light and correction made possible.

The Car Record Office is divided into two main branches, Mileage and Record. The work of the mileage branch is to compute mileage on all rolling stock; domestic, foreign and private ; and is separated into the following items:

Passenger.
Baggage.
Freight loaded, East bound.
Freight loaded, West bound.
Freight empty, East bound.
Freight empty, West bound.
Freight caboose, East bound.
Freight caboose, West bound.
Freight construction.
Freight switching.

The total mileage is classified and record kept, showing mileage made by each mark or initial for month after which notice or statement is rendered to each company owning cars, showing the mileage made by freight cars, passenger cars and baggage cars with the amount due them for car service. This is so varied that in some cases it is required that freight car mileage be divided into from two to twelve different items.

Record is kept showing number of passenger and baggage cars, loaded and empty freight cars in road service, loaded and empty freight cars in switching service, loaded and empty cars in construction service for each engine on the road, also showing

the amount of mileage in each case, for which report is rendered monthly to the Superintendent of Motive Power.

Record is kept of all train mileage, passenger and freight, the passenger being divided into classes as follows:

Regular trains.

Trains not carrying passengers.

Excursion trains.

Specials not earning revenue.

All trains handling cars and all trains light (with caboose only) and report of this is rendered monthly to the Auditor, which also shows:

Average number of cars in passenger trains.

Average number of cars in freight trains.

Number of loaded cars in freight trains.

Number of empty cars in freight trains.

A recapitulation of these monthly reports is made in July, covering the 12 months preceding, that is, July to June, inclusive, and this is used by the Auditor in making reports to the Interstate Commerce Commission. The same thing occurs again in January, covering 12 months, January to December, inclusive, for use in the annual report, etc.

In computing the mileage of passenger and baggage cars a greater amount of detail is necessary. On passenger and baggage cars in addition to the reports rendered as mentioned, showing total mileage made and the amount due for car service, it is necessary to render a monthly statement to the company owning such cars, showing the individual cars and mileage for same. We also receive similar reports from roads handling our cars and when all the reports are received they are recapitulated and report is made to the Master Car Builder, showing total mileage for each individual car in home passenger equipment on home road and foreign roads to enable him to compute wheel service records. With the home freight car equipment a still greater amount of detail is necessary for statistical purposes. The total average of each class of freight car is kept, viz: box, coal, coke, flats, etc. This report shows the average number of cars in each class owned for each month, the average number in each class on foreign roads daily, the average number in shops daily, the average number in road department service daily and the average number in freight service on home road daily, which

makes it necessary to get such information, that the records be computed to find the total number of days each car in each class was off the road during the month and the number of days they were on home road. The latter amount, days on home road, is sub-divided, showing the average in shops daily, which is computed from reports furnished by car department at all shops, the number used in road department service, computed from daily reports of construction trains, the remainder being the amount in freight service. This report shows the total mileage for all cars in each class, the average for each day, and the average miles per car per day on home road. Also mileage of home cars on foreign roads and the average miles per day per car on foreign roads and the average miles per car per day on home and foreign road, total mileage of foreign cars on home road and the average miles per day. The grand total of mileage of freight cars on home road is itemized as follows:

Total number of miles made by home cars on home road, loaded and empty.

Total miles made by foreign cars on home road, loaded and empty and total miles made by all cars, loaded and empty.

In this branch is also kept record, showing on what road home cars make mileage in order to check car service reports from each road monthly.

This is purely the accounting side of the Car Record Office and must be in the hands of careful men or costly errors will be the result.

The Record branch, which is of no less importance and of far mcre interest to the operating department should be as carefully watched, as the information for which this branch is called upon to furnish is important and almost too numerous to mention in this article. However, each move a car makes must be recorded. There are a number of different kind of records in use on the different roads. Some of them might be rated first class, others very poor, but praise for the good ones and criticism for the poor ones is not my intention. They all get the same results, or nearly so, and in so doing fill their mission. Each over, short or damage report sent to the Freight Claim Agent, a record of the car containing such freight must be made, showing train and conductor handling same. Each foreign car repaired

on the line for which owners are responsible under Master Car Builder's rules, must be checked by record office before bills are made against owners to see if numbers and initials are correct, and thus prevent changing of bills; and each bill sent for repairs to your cars while on foreign roads must be checked to prove that the cars were actually on such roads when repairs are said to have been made.

It is customary for all record offices to send Junction cards to owners of cars when their cars are delivered to foreign connections. Record is made of these cars in record book the same as a local movement and the cards are kept to check against mileage reports. These cards are of great value to record offices now and will be of much more importance when per diem is adopted.

Under the mileage system it is not possible to check correctly the mileage made by cars on foreign roads and their statement of same must be accepted as correct. It is not likely that any railroad would purposely report short mileage, but errors are likely to occur in the best regulated offices. However, in the per diem system days count, and check against all lines will be made possible.

In the Record Office of a busy railroad thousands of records of car movements are made daily, a large majority of which are never referred to. Maybe of one thousand records only one is ever asked for; 999 of them are possibly correct, but the one wanted is incorrect, and the Record Office is condemned. When the possibilities of error are considered the average Record Office is comparatively free from errors. The conductors take the numbers and initials under all conditions, both as to weather and in the shortest possible time and only those who have handled car numbers for any length of time can comprehend how easy it is to transpose car numbers. If the car number is 174 it is an easy matter for the conductor to make it 147, and is a common mistake, and if the record is made for 47 and the record wanted is 74 the clerk looks for 74 and says "no account." In many instances it is possible to correct such errors by a good record clerk and many errors are detected daily and corrected, but there are so many cases where agents, yard clerks and conductors simply copy the numbers, and if the first man to take the number makes a mistake it goes through to destination by an erroneous

number. This happens frequently. Railroads with the same initials cause the Record Office no end of trouble. B. & A. may mean Boston & Albany or Bangor & Aroostock, W. C. may mean Wisconsin Central or Washington County, P. C. Co. may mean Pittsburg Coal Co., or Pennsylvania Coal Co., and so on, far too many cases to mention in this article.

This branch of the office does all the tracing both of domestic and foreign cars and this is a very important part of the work. In theory a car is permitted to run through to destination with freight on condition that it is promptly unloaded on arrival at destination and returned at once to the home road. The practice is hardly in keeping with the theory. Agents and yard masters will place any kind of a car to load to any point if not closely watched. However, shippers are sometimes as much to blame as any one. I have a case in mind where a Northern Paciffc car and a Boston & Maine car were given to one mill for loading. The Northern Pacific was loaded to Portland; Maine, and the Boston & Maine car to a point in Oregon. The cars had to be transferred by the railroads or the misuse allowed. Two railroads get into this mill and the mill people refused to transfer the freight, and if the road putting the cars into the mill had refused to allow the cars to go forward or to transfer them without cost to the mills, they would have been turned over to the other road and allowed to go forward.

The freight car equipment of the United States makes a very poor movement when considered as a whole. The average movement being something less than two hours every twenty-four hours. Under the mileage system there is nothing to hurry the cars home if any loading is in sight. It costs nothing to hold the car but the space it takes up on the side track. Per Diem will change this, as the car will be earning the owners as much if left standing still, as if kept in motion. The practical operation of Per Diem may cost considerable more, but if it increases the movement from two hours in 24 to three hours in 24 it has increased the efficiency of the cars 50 per cent. without adding any more cars. The Per Diem means a premium on the prompt movement of foreign cars, and a penalty on their delay.

It may be of some interest to you to see the record of a car when away from home. I have before me the record of P. & L.

E. box car 850 on one trip. It is bad but there are others much worse that can be found in any Record Office :

P. & L. E., 850, to—

N. Y., P. & O.,	6-19-1900
L. S. & M. S.,	6-21
A. A.,	6-22
W. C.,	6-27
C. M. & St. P.,	8- 6
W. C.,	8-29
A. A.,	8-30
L. S. & M. S.,	9-29
C., H. & D.,	10-11
L. & N.,	10-14
T. P.,	10-19
L. & N.,	10-21
T. P.,	10-30
L. & N.,	11-22
W. of A.,	11-23
C. of Ga.,	11-24
Cot. Belt,	11-27-1900
C. of Ga.,	11-30
C. W. C.,	12-10
C. of Ga.,	12-14
Plant,	12-22
Southern,	1-13-1901
S. C. & G. Ex.,	2-18
Southern,	2-23
C. of Ga ,	3- 8
W. & A.,	3- 8
A. K. & N.,	3-18
N., C. & St. L.	3-28
C. & W. C.,	4-15
Ga. R. R.,	4-25
N. C. & St. L.,	4-26
Ga. R. R.,	4-27
N., C. & St. L.,	4-27
C. of Ga.,	4-29
N. C. & St. L.,	——
C. of Ga.,	4-30

W. & A.,	5- 3
L. & N.,	5- 8
Big Four,	5-10
L. S. & M. S.,	5-11
Toledo Belt,	5-28
L. S. & M. S.,	5-31
N. Y., P. & O.,	6- 2
Home,	6- 3

The car was away from home eleven months and fourteen days.

The Car Record Office is an important office on a railroad, and is necessarily a part of the Transportation Department. Its value is being recognized more every day. More could be said on the subject but I have already taken up more than my alloted time.

In conclusion a good Car Record Office is of inestimable value to a railroad, a poor one is an abomination. The former cannot be run short handed nor with poor clerks.

President: The next order of business is the discussion of the subject presented at the previous meeting. I believe you are all supplied with the printed copy of the paper on that subject and it is the understanding that Mr. H. W. Watts will open the discussion.

Mr. H. W. Watts: Mr. President and Gentlemen—You will notice a coincidence in that among the names of those assigned in this discussion are two from the same railroad.

Before presenting to you the serious discussion of the car record question, I will ask you to allow me to read you here something of an explanatory nature.

Three railroaders hatched a conspiracy bold,
(With sadness the miserable tale we unfold,)
They were Yohe, and Gist, and J. D. Conway,
Fit subjects all for the poets lay.

A remedy sure, these worthies had found
For the troubles with which all railroads abound,
With the aid of this wonderful cure called "Per Diem,"
They thought they could meet and boldly defy 'em.

No more would the voice of the shipper be heard
  In sarcastic tones asking "how it occurred,"
"That *their* orders for cars could never be filled,
  Their siding or warehouse so seldom was drilled."

"No more will blockades and congestion annoy,
  These troubles will vanish and all will be joy,
For the use of 'Per Diem' will cure every ill,
  With the greatest of ease every order will fill."

But one note of discord their harmony marred,
  And one speck of trouble their peacefulness jarred,
One road declined to come into the fold,
  And this beautiful plan of "Per Diem" uphold.

"Oh, what shall be done to punish these jays,
  Who refuse their assistance our rev'nue to raise;
All penalty notices they disregard,
  By the beard of our President, this is *too* hard."

"A fearful revenge we will take on these men,
  We'll ask them to speak on this question, and then,
In the Railway Club, with its membership skilled,
  We'll harass them until with sorrow they're filled."

One miscalculation interfered with their plot,
  Well planned to accomplish the end which they sought,
'Tis well to remember when vengeance you seek,
  How *thick* and how *hard* is a railroader's cheek.

I was afraid, gentlemen, when I started to read that I would find myself in the position of a preacher who was called upon to address an Institute for the Feeble Minded in a certain town. Let me explain here that the comparison is to the speaker, not the audience. (Laughter.) Thinking to interest them, he told the story of the Hindoo mothers who were in the habit of throwing their children into the Ganges River. While he was telling the story he noticed a dog-faced fellow looking at him very intently. Stepping up to him after the close, he said: "I saw that you seemed very much interested while I was telling that story, and I wondered what was passing through your mind?"

"Well," says the fellow, "I was wondering why your mother didn't drown you."

(Applause and laughter.)

Now in regard to this question, like all others, with a membership composed of such varied interests, we are always up against a pretty hard proposition to find a subject which will equally interest all the members. Each of us has a specialty, and we are apt to assume that everybody else is as familiar with the details of that as we ourselves. So it occurred to me that it might add to the interest of Mr. Gist's very able paper if I should speak very briefly with regard to the details of the car record work. You will remember that it was suggested when we had up the matter of a steam indicator, that an explanation of a steam indicator and its working would be of interest, and this we all found to be so.

Now I venture to say that few people who have occasion to ask for the record of a car which came in, say last month, and while you wait at the telephone a clerk goes back and gets you the record of the car, the time they received it, when they delivered it, giving you a complete movement of it, few people have any idea of the system which is required to effect such promptness as that. If the same clerks had entered the 12,000 or more cars which are received each day on the P. & L. E. for instance, just as they come into the yards, it would have taken that person all day, probably, and even then perhaps he would not have found that car.

I will take my own road now because I am more familiar with it. The plan however was borrowed from Mr. Gist's office, of which it is simply a modification to suit local conditions. While he uses a number of books, one for each large road, we use one book and assign certain proportions of it for each road. Now you want to know something about L. S. & M. S. 25,001, we will say. The clerk turns to the book and runs down the tabs until he finds L. S. & M. S. All numbers from 11,000 to 12,000 are on one page; on another tab 12,000 to 13,000, on another 13,000 to 14,000, and so on. Now he turns to the tab marked 25,000. On this page there is a further sub-division, for there are ten figures printed for the last figure of every number, printed permanently in the book. So the clerk runs that column of figures down until he finds the particular one he wants. It is first divided by roads, then by a series of figures representing the cars by thousands, and then further sub-divided into blocks of

ten units, so it makes it a very simple matter to find the car that is wanted and ascertain its record. I may say that the pages are arranged somewhat like a cross section of engineering paper, the perpendicular lines down the page each representing a day of the month. So that I see in our book car received September 9; and I find a little letter P within that particular square, showing that the road from which it was received was the P. & L. E; or perhaps a letter N showing that it was delivered to our North yard, or a little B if delivered to the B. & O.

As to the application of the car record system to the car department, we have a system of keeping our records of the car department based on the car record system, which we find very valuable. For instance, goods are lost in transit. Some of you gentlemen have a claim against the railroad company. The shipment comes from Chcicago over the Lake Shore and P. & L. E., and it passes through the hands of each. The first question is, was that car damaged en route so that the lading could be lost? When it comes to us all we have to do is to take that car number, and by the application of the same system, slightly modified, within two minutes we have all our inspectors' reports before us. They are indexed at the end of each month, and we run down that index until we find the car number, which comprises the name of the inspector, the point at which it was inspected, and the date on which the accident occurred. We turn to that inspector's report and find the full particulars. We find not only the inspector's report in this way, but the wreck master's report and the reports of the conductors of each accident. So that they are all referred to under the same system.

I have brought with me a sheet. It is too small to be well seen at a distance, but perhaps I can show you something of the system.

(Here the speaker illustrated the system by the printed form in his hands.)

President: Can we not hear from Mr. Hyndman on that subject?

Mr. N. P. Hyndman: Well, gentlemen, as this is my first appearance before you, though a member from the start, I believe, I have to acknowledge that I have not studied this subject since you had your last meeting, and I must say that I am not sufficiently informed to enlighten you very much on this subject.

I thank you very much for the invitation.

President: Can we not hear from Mr. Stark?

Mr. F. H. Stark: Mr. President and Gentlemen—I am afraid this subject is a little foreign to me. Although I appreciate that if I am to become a member of the Pittsburgh Railway Club I will have to study up on all subjects.

I realize that the office of car accountant is an important one, and I believe that on every road there should be such an office, and that the distribution of cars should be under the supervision of the superintendent of car service. On some roads there is appointed under the transportation department some person or other, generally in the dispatcher's office, and it is through this office that the cars are distributed. And it is very frequent that the instructions of the car accountant and car distributor conflict. I am satisfied that it can not be handled so satisfactorily as where it is handled through the one office.

From the mechanical standpoint it is very important that the car accountant's record be accurate. For all the bills made for and against a railroad, must, of course, be checked up. And the head of the mechanical department, in returning a bill on account of the car not having been on the line, and having it proven afterwards that it was, is a little bit embarrassed. And for that reason, from the mechanical standpoint, we desire to have accurate information.

The car accountant is handicaped, too, in not having reports come to him in a shape that he can depend on, for the reason that a great many of his reports are from conductors; and of course men who are in that line of railroad avocation are not by any means clerks, and they are apt to get the car numbers mixed up, and have the reports come to the car accountant in an incorrect manner, and thus create a great deal of checking up and corrections to be made.

I suppose it would be altogether out of order to talk on the subject of per diem, and therefore I shall be glad to hear from others on the subject under consideration.

President: I know we would be glad to hear from Mr. Safford.

Mr. J. B. Safford: Mr. President and Gentlemen—I have nothing prepared for this subject.

President: Can we have a word from Mr. O'Toole?

Mr. J. L. O'Toole: Mr. Chairman and Gentlemen—I am sorry to say that there are not very many things that I know about a railroad, outside of the car record office. But I have glanced over Mr. Gist's very able paper and find that I can not add very much to it. He has covered the ground very comprehensively.

President: Does any other gentleman wish to say anything on this subject? If not, I will call upon Mr. Gist to close the discussion.

Mr. Gist: Mr. Chairman and Gentlemen—I did not expect that I would be called on to say anything or I would not have said so much in the paper. I have told you all I know.

There is a good bit of detail connected with the car record office that railroad men generally know nothing about and do not appreciate what an effort it is to keep it with any degree of accuracy for ready reference. Mr. Watts has outlined to you briefly the system that we keep ourselves in separating the car numbers by their unit, so that any car number you want you have only to look at half a dozen, or ten figures at the outside, to locate your car. We follow that in everything where we handle car numbers.

In case of a transfer of freight every car that is transferred is reported and we record that car in its numerical order, using the unit system, and show into what car it was transferred. So that when you are tracing a car and have found that it stops at an out of the way place and does not go any farther, we immediately turn to the transfer book and we can see that it was transferred into another car; then we look for the record of the other car through to destination.

I want to thank the gentlemen for the complimentary remarks on the article.

Mr. H. W. Watts: Will you tell us about the use of the junction cards?

Mr. C. L. Gist: With all foreign cars that we deliver to a connecting line—that is, suppose we have a Lake Shore car that we deliver to the Monongahela Connecting, we have a junction card which we fill out showing number and the date it is delivered to the Monongahela Connecting. If Mr. Watts delivers that car to the B. & O. he sends a junction card to the Lake Shore showing delivery to the B. & O. And if the B. & O. delivers it to the Pennsylvania they send a junction card to the Lake Shore.

So it is followed clear along, as I have illustrated with one car P. & L. E. 850. I have all this record by the junction cards sent by the different roads, and of this particular car it is complete with the exception of the record from the Central of Georgia. It was delivered to them on April 29th, and the next record is from the N. C. & St. L. to the Central of Georgia, so there is one movement missed. We follow every car that is away from home and the record is made in our own book just the same as a local movement on the road.

Of course under the per diem system these cards are used to get the number of days the cars are on the foreign road. Take this car delivered to the Lake Shore, June 21st, delivered to the Ann Arbor, June 22d, so the Lake Shore must pay for it for one day, substracting the receiving date from the delivering date.

Mr. N. P. Hyndman: Mr. Gist has told us about the transfer of a car. Take a car at a certain point, and it is transferred to another one, and the connecting car is the one then that is traced. Will he kindly tell us what disposition is made of the car that he has just left; that was broken probably?

Mr. Gist: If the car does not move within a reasonable time, we get after it. It may be that the car is totally destroyed or damaged so that it had to be repaired, and the mechanical department neglected to report it. We look that up. Ordinarily within a few days after a car is destroyed it is reported to us and we make a note of it on the book just the same as a movement, "car destroyed." Or if the car was only damaged it will show in to our shops. We keep a record showing cars into the shop, and another one when they come out. I do not know that I quite understand your question, if that does not make it clear.

Mr. N. P. Hyndman: You do keep a record of that car until it goes back to the owner's possession?

Mr. Gist: Yes, sir.

Mr. N. P. Hyndman: And is the owner notified when it goes into the shop?

Mr. C. L. Gist: No, we do not report when it goes into a shop or when it comes out, only when totally destroyed.

Under the present system, with per diem, if the car goes into the shop and is held for material which the owner furnishes, we notify them as soon as the material is ordered, and per diem ceases until that material is received. In that way the owner

knows when the car goes into the shop. But if the car is totally destroyed the owner is notified immediately.

President: This Club has an invitation to go out to the plant of the Keystone Car Wheel works this afternoon and inspect the plant and the manufacture of car wheels. Mr. Slocum, the president of the company, is here and will take charge of the party.

We are fortunate to announce that at the next meeting Mr. Slocum's paper comes upon the subject of "Cast Iron Car Wheels."

Mr. Slocum: We have a couple of special cars engaged at the corner of Sixth avenue, to be there at 3:15, which will be there probably by the time we get there.

President: That being the case, and the time being short to reach the car, I will declare the meeting adjourned, without any formal motion.

The members of the Club and visitors present were then taken to the works of the Keystone Car Wheel Co., at Hays station, as the guests of that company, where the process of cast iron wheel manufacturing was practically illustrated, from the melting of the metal to the finished wheel, also showing tests that wheels are subject to by the M. C. B. rules and including the thermol test.

The Club was then invited to the pattern room of the company where a bountiful collation was spread and earnestly discussed. ("The water was furnished from well on the Company's ground.) The Club expressed their appreciation of the entertainment by a unanimous vote of thanks to the members of the company, and boarded the special cars provided for their accommodation and were given a trolley ride to Homestead, thence back to the city through the beautiful East End Boulevard.

Everything was *comme il faut*.

SOCIETY OF RAILWAY CLUB SECRETARIES

OF THE UNITED STATES AND CANADA.

ATLANTA, GA., August 5th, 1902.

Mr. J. D. Conway, Secretary,
Pittsburg, Pa.

Dear Sir—At the last meeting of the society at Saratoga Springs, N. Y., June 18th and 19th, the following motions were made, to be balloted on by letter ballot. Will you kindly take up these matters at the earliest possible moment, and forward your ballots to me, that I may notify each Club the result with as little delay as possible.

"That the exchange of Proceedings between sister Clubs be made on a basis of 50c per year; i. e., if the member of any Club desires the report of another Club, he must pay 50c per year for the Proceedings of each Club he orders."

"Motion for Amendment of Rules, Article 9, by striking 'twice each year at such time and place as shall be decided on at previous meeting' and read 'once each year in connection with M. C. B. and M. M. Conventions and on the last day of the first Convention,"

"Also that Article 12 be changed to read as follows:

'Roll call,

'Reading of minutes of previous meeting,

'Election of new members and officers,

'Unfinished business,

'New and miscellaneous business,'

And that the 'location of time and place of next meeting' be eliminated."

I also enclose herewith a copy of the Proceedings of the Convention, and make the request, if consistent, that you publish same in the next issue of your Proceedings.

With best wishes, and trusting to have an early reply, I am,

Yours truly,

A. J. MERRILL,
Secretary-Treasurer.

Saratoga Springs, N. Y., April 18, 1902.

The Society of Railway Club Secretaries of the United States was called to order at 3:40 p. m. in Room 634, Grand Union Hotel, Chairman Janes presiding.

Secretary Love being absent, A. J. Merrill, of the Southern & Southwestern Railway Club was appointed Acting Secretary.

On roll being called, the following gentlemen answered to their names :

E. L. Janes, New England Railway Club.

E. A. Chenery, St. Louis Railway Club.

Jos. W. Taylor, Western Railway Club.

H. D. Vought, Central Railway Club.

The New York Railway Club was represented by Mr. Brady, the Northwest Railway Club by Mr. Van Alstine and the Southern & Southwestern Railway Club by Mr. Merrill.

Minutes of the previous meeting were read by Acting Secretary and approved.

Under the head of new business, motion was made by Mr. Vought that the Committee on Publication of the History and Rules of the Society be extended a vote of thanks for the very efficient manner in which they carried out their work. Seconded by Mr. Taylor and carried.

Motion was made that the Secretary furnish each Railway Club in the United States and Canada, whether they belong to the Society or not, with a copy of the minutes. Carried.

Mr. Jos. W. Taylor then requested that each Club, so far as possible, use the subjects to be discussed by the Master Mechanics and Master Car Builders Associations at their next meeting, for their subjects during the coming year. This was afterwards put in the form of a motion and carried.

The Secretary-Treasurer then submitted the following report :

Financial Statement.

Cash on hand, June, 1901	$ 18 56
Collections for 1902	40 00
Total	$ 58 56

Expense, stamps and Secretary's office	$ 4 25		
" printing through Chairman Janes	6 85		
		11 10	
Cash on hand		$ 47 46	

COLLECTIONS FOR 1902.

New England Railway Club	$ 10 00
Central Railway Club	5 00
Western Railway Club	5 00
Pacific Coast Railway Club	5 00
New York Railway Club	10 00
Southern & Southwestern Railway Club	5 00
	$ 40 00

Which was accepted and ordered spread upon the minutes.

Under Application for Membership the following were presented:

J. D. Conway, Pittsburgh Railway Club.

M. P. Kelley, Canadian Railway Club.

C. C. Borton, Pacific Coast Railway Club.

On vote, the Chairman was ordered to cast the ballot, and the gentlemen, as representatives of their respective clubs, were duly declared elected.

The election of officers then took place, with the result of E. L. Janes' re-election as Chairman, Jos. W. Taylor's re-election as Vice-Chairman, and the election of A. J. Merrill, of the Southern & Southwestern Railway Club as Secretary-Treasurer.

The exchange of Proceedings between sister Clubs was then discussed, resulting in Mr. Vought making a motion that the exchange of Proceedings be made on a basis of 50c per year for the reports of each sister club; i. e., if a member of any Club desires the reports of another Club, he must pay 50c per year for the Proceedings of each Club he orders. This motion was tabled for an adjourned meeting to be held the following afternoon.

Motion made that the Secretary forward to each Club a list of the Members and Associate Members, with the request that they revise and return to the Chairman of the Society. Carried.

Motion for Amendment of Rules, Article 9, by striking "twice each year at such time and place as shall be decided on

at previous meeting" and read "once each year in connection with M. C. B. and M. M. Conventions, and on the second day of the first convention."

Also that Article 12 be changed to read as follows:

"Roll call,

"Reading of minutes of previous meeting,

"Election of new members and officers,

"Unfinished business,

"New and miscellaneous business,"

And that the "location of time and place of next meeting," be eliminated.

These amendments were tabled to be balloted on by letter at the end of thirty days, as required.

There being no further business the Society adjourned to meet the following day at 3 o'clock P. M.

Respectfully submitted,

A. J. Merrill,

Secretary-Treasurer.

Saratoga Springs, N. Y., June 19th, 1902.

The adjourned meeting of the Society of Railway Club Secretaries was called to order at 3:30 P. M., and minutes of previous meeting read and approved as corrected.

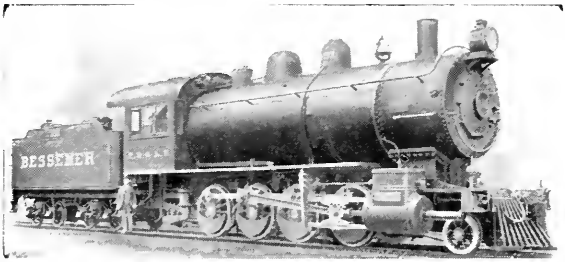
Chairman Janes read a number of communications, and the motion of Mr. Vought, laid on the table from previous meeting, was then taken up, and after animated discussion, it was moved and carried that this motion be submitted to the different Railway Clubs for letter ballot, and that the decision be made known to all Clubs.

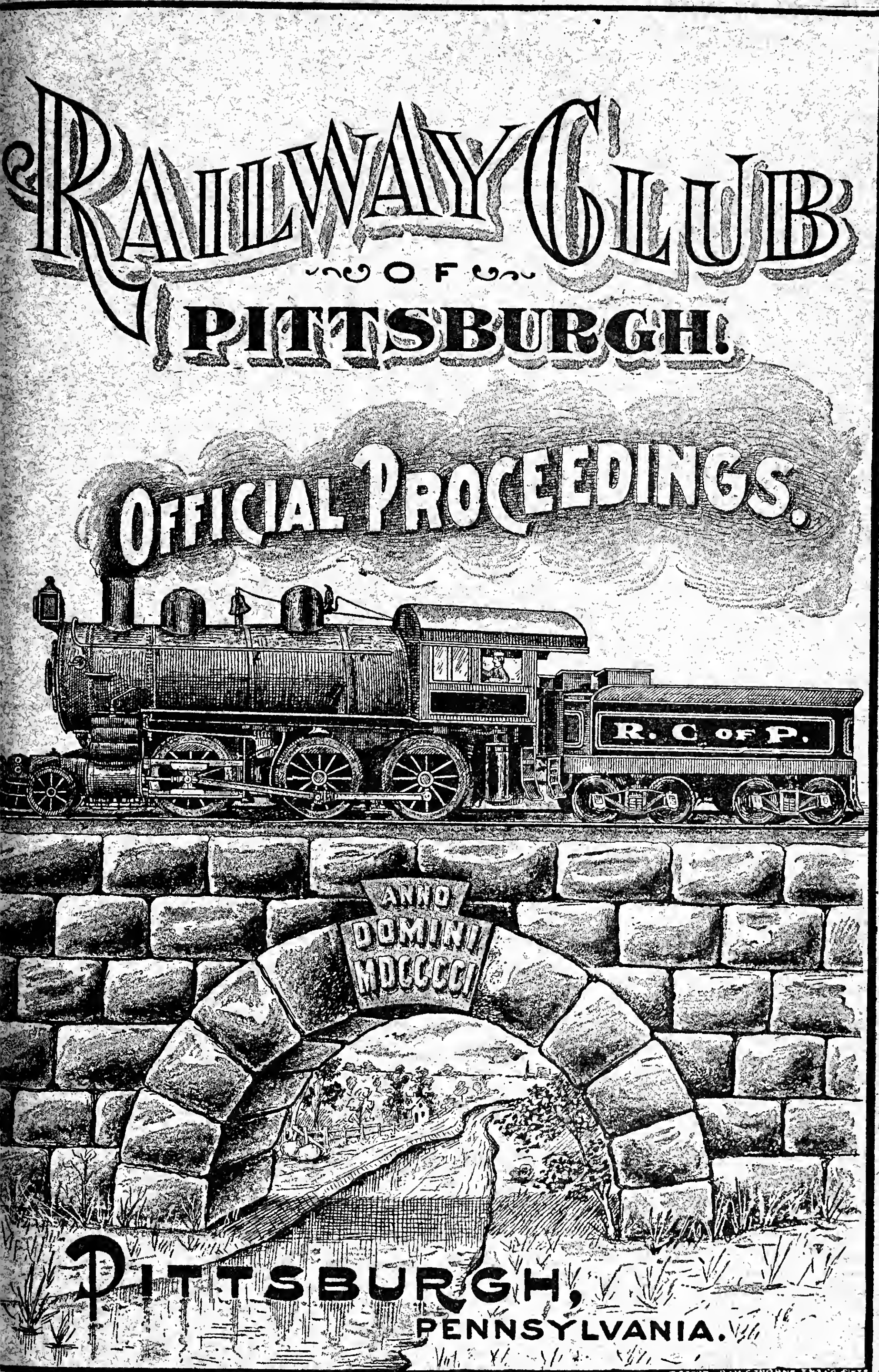
There being no further business before the Society, they adjourned to meet the following year.

Respectfully submitted,

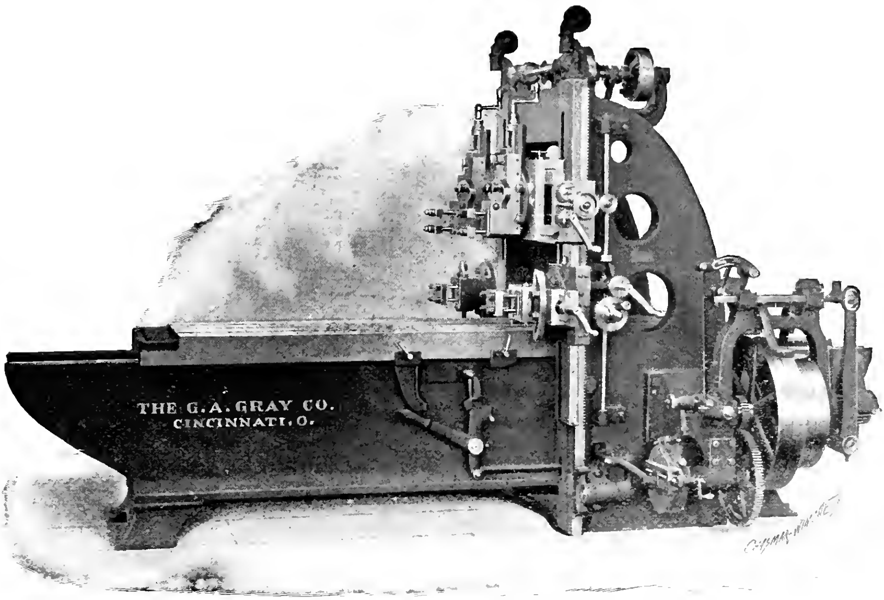
A. J. Merrill,

Secretary-Treasurer.


BESSEMER



OCTOBER, 1902


THE G.A. GRAY CO.
CINCINNATI, O.

Classified Index of Advertisements

Index—Continued.

OFFICIAL PROCEEDINGS

of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

OFFICERS, 1901 - 1902.

President,
J. H. McCONNELL,
Manager American Locomotive Co., Pittsburgh, Pa.

Vice-President,
L. H. TURNER,
Supt. Motive Power, P. & L. E. R. R. Pittsburgh, Pa.

Treasurer,
J. D. McILWAIN,
Sales Agent, J. D. McIlwain & Co., Pittsburgh, Pa.

Secretary,
J. D. Conway,
Chief Clerk, Supt. M. P., General Offices P. & L. E. R. R, Pittsburgh, Pa.

Executive Committee,

D. F. CRAWFORD,
Supt. M. P. Penna. Lines West of Pgh., Ft. Wayne, Ind.

J. E. SIMONS,
Treasurer Fox Foundry and Machine Co, 310 Frick Building, Pittsburgh.

F. T. HYNDMAN,
S. M. P., Bflo, Roch & Pgh. R. R. Co., Du Bois, Pa.

VOL. I. No. 9. Pittsburgh, Pa., October 24, 1902. $1.00 Per Year. 25c. per Copy.

Published monthly, except June, July and August, by the Railway Club of Pittsburgh, J. D. Conway, Secretary, General Offices P. & L. E. R. R., Pittsburgh, Pa.

Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF ANNUAL MEETING, OCTOBER 24, 1902.

The meeting was called to order at 8 o'clock P. M., at the Hotel Henry, Pittsburgh, Pa., with President J. H. McConnell in the chair.

The following gentlemen registered:

MEMBERS.

Alexander, J. W.
Anderson, E. H.
Armbrust, C. W.
Bartley, Milton.
Bayes, John S.
Blattner, Joseph.
Bowery, F. J.
Bown, W. H.
Brown, John T.
Buchanan, W. J.
Campbell, G. M.
Carson, G. E.
Conway, J. D.
Courtney, D. C.
Dallam, C. B.
Diamond, P. R.
Dow, G. N.
Ford, D. W.
Gies, Geo. E.
Gist, Chas. L.
Goodell, George H.
Gray, R.
Grove, E. M.
Grooms, J. C.
Hall, H. F.
Haas, Ben.
Howe, David M.
Hukill, J. L.
Hyndman, F. T.
Johnson, A. B.
Jones, Col. D. P.
Keppel, A. M., Jr.
Kerr, Edward.
Kessler, D. D.
Kinnaird, L. S.
Miller, John F.
Miller, Geo. W.
Miller Marion M.
Milligan, John D., M. D.
Morris, W. B.
McConnell, J. H.
McFeatters, F. R.
McIlwain, H. M.
McIlwain, J. D.
McKee, S. Frank.
McNulty, Frank M.
Obey, G. B.
O'Toole, J. L.
Pelletier, Louis.
Pfeil, John.
Porter, Chas.
Postlethwaite, C. E.
Redding, D. J.
Rhodes, Geo. P.
Riley, J. W.
Riley, Geo. N.
Ritchie, J. M.
Safford, Jas. B.
Sargent, F. W.
Schoeneman, C.
Schoonmaker, Col. J. M.
Searles, J. R.
Shaler, Fred J.
Simons, J. E.
Simmons, W. M.
Slocum, A. W.
Smith, Ross W.
Sweeley, G. P.
Terry, W. A.
Tucker, John L.

Kirk, J. T.
Klee, W. B.
Klingensmith, W. H.
Lininger, Wm.
Lindstrom, Chas. A.
Macoubray, R. J.
Mason, E. Scott.
Mason, Stephen C.
Maury, Geo. P.
Miller, Orlando.
Turner, L. H.
Warne, J. C.
Watts, H. W.
Weigel, F. S.
Weisbrod, J. F.
Wendt, Edwin F.
Whinery, S. B.
Whitney, Louis B.
Wright, R. V.
Wright, William.
Yohe, J. B.

VISITORS.

Barrett, J. H.
Caldwell, Geo. B.
Carpenter, Frank.
Cullem, Jas. K.
DeRemer, W. L.
Goodwin, John M.
Hobson, Bailey E.
Hallett, R. C.
Hunter, R. F.
Kennedy, D. B.
Knox, Wm. J.
Lighthill, S. C.
Maltby, Geo. B.
Mendenhall, C. M.
Miller, Edward P.
McCormick, W. H.
McCullum, Ex-Chief Justice.
Partington, James.
Post, Geo. A.
Reagan, P. J.
Scott, Dr. X. C.

President: The minutes of the last meeting being printed, if there are no corrections we will take up the next order of business, announcement of new members. Mr. Secretary, will you kindly read the list.

Secretary: The following applications for membership have been received:

G. M. Campbell, Electrical Engineer, P. & L. E. General Office, Pittsburgh, Pa.

Francis B. DeGress, M. E., New York Manager Crocker-Wheeler Co., 39-41 Cortlandt street, New York.

Henry J. Sage, E. E. Representative Crocker-Wheeler Co., 607 Empire building, Pittsburgh.

Gano S. Dunn, E. E., V. P. and Chief Engineer, Crocker-Wheeler Co., Ampere, N. J.

Harley G. Smith, Representative Cleveland Twist Drill Co., Cleveland, O.

Milton Bartley, President American Nut and Bolt Fastener Co., 306 Frick Building, Pittsburgh.

F. E. Olson Groenlie, Draftsman, P. & L. E. General Office, Pittsburgh.

Louis Pelletier, Resident Manager Railway Age, 510 Frick building, Pittsburgh.

S. B. Whinery, General Manager Pittsburgh Blue Print Co., 1505 Park building, Pittsburgh.

Fitzwilliam Sargeant, Chief Engineer Tests American Brake Shoe and Foundry Co., 170 Broadway, New York

E. D. Steinman, Treasurer Wisconsin Graphite Co., Allegheny, Pa.

J. S. Bonsall, Manager American Engineer and Railroad Journal, 140 Nassau street, New York.

George W. Miller, General Manager American Nut and Bolt Fastener Co., 306 Frick building, Pittsburgh.

A. M. Keppel, Jr., Assistant Train Master Pennsylvania R. R. Co., Twenty-eighth street, Pittsburgh, Pa.

Paul Synnestvedt, Mechanical Engineer and Patent Attorney, Frick building.

S. D. Evans, Master Mechanic Allegheny & South Side R. R. Co., Tenth and Muriel streets, S. S., Pittsburgh.

J. McLellan, Master Mechanic Pennsylvania R. R. Co., West Penn Division, Allegheny, Pa.

D. M. Perine, Master Mechanic Pennsylvania R. R. Co., Twenty-eighth street, S. S., Pittsburgh, Pa.

W. Lininger, Master Mechanic Pennsylvania R. R. Co., Monongahela Division, S. S., Pittsburgh, Pa.

H. F. Hall, Superintendent Machinery Pressed Steel Car Co., McKees Rocks, Pa.

J. B. Greer, Manager Pittsburgh Filter Manufacturing Co., Empire building, Pittsburgh.

H. E. Gilpin, General Superintendent Erie R. R. Co., Cleveland, O.

R. L. Whitton, Representative Berry Bros., Ltd., Detroit, Mich.

G. H. Soles, Master Carpenter, P. & L. E. General Office, Pittsburgh.

A. L. Holmes, Assistant Master Mechanic West Penn Division, P. R. R., Allegheny, Pa.

M. R. Maloy, Assistant Master Mechanic Monongahela Division, P. R. R., S. S., Pittsburgh, Pa.

F. J. Bowery, Chief Draughtsman McConway & Torley Co., Forty-eighth street and A. V. R. R., Pittsburgh, Pa.

Orlando Miller, Purchasing Agent Westinghouse Air Brake Co., Wilmerding, Pa.

J. C. Warne, Superintendent Machinery Pennsylvania Casting and Machine Co., 505 Preble avenue, Allegheny, Pa.

R. E. McCarty, Superintendent Pennsylavania Lines West of Pittsburgh, Pittsburgh, Pa.

W. M. Doulin, Assistant Secretary and Treasurer P. & L. E., General Office, Pittsburgh, Pa.

W. J. Caton, C. C. to Chief Engineer P. & L. E., General Office, Pittsburgh, Pa.

F. J. Nanna, Assistant Engineer P. & L. E. R. R. Co., Roscoe, Pa.

W. B. Morris, Chief Clerk to General Passenger Agent, P. & L. E. General Office, P. & L. E. R. R. Co., Pittsburgh, Pa.

E. P. McKenna, General Freight and Passenger Agent Cumberland & Pennsylvania R. R., Cumberland, Md.

C. Flinn, General Superintendent Pressed Steel Car Co., Allegheny, Pa.

C. B. Dallam, President Pittsburg Oil Refining Co., Box 1315, Pittsburgh, Pa.

J. R. Howgate, Superintendent American Locomotive Co., Pittsburgh Works, Allegheny, Pa.

Ross W. Smith, F. C. A., P. & L. E. R. R. Co., General Office, Pittsburgh, Pa.

Col. J. M. Schoonmaker, Vice President and General Manager, P. & L. E. R. R. Co., General Office, Pittsburgh, Pa.

President: These names having been passed upon by the Executive Committee and approved, these gentlemen are elected to membership.

A number of communications were read by the Secretary, among them the following:

THE WESTERN UNION TELEGRAPH COMPANY.

Union Station, St. Louis, Mo., Oct. 24, 1902.

J. D. Conway, Secretary
Railway Club of Pittsburgh,
Pittsburgh, Pa.

The St. Louis Railway Club sends greetings and congratulations on year's record.

E. A. Chenery, Secretary.

POSTAL TELEGRAPH-CABLE COMPANY.

Philadelphia, Pa., Oct. 24, 1902.

Mr. J. D. Conway, Secretary
Railway Club of Pittsburgh,
Pittsburgh, Pa.

Mr. Vogels joins me in best wishes for a good time on your first anniversary. Both regret inability to be with you.

W. C. DeArmond.

POSTAL TELEGRAPH-CABLE COMPANY.

Dayton, Ohio, Oct. 24, 1902.

Secretary Railway Club of Pittsburg,
Hotel Henry, Pittsburgh, Pa.

Very sorry I missed my train for Pittsburgh. Good luck.

T. H. Symington.

New York, Oct. 20th, 1902.

J. D. Conway, Secretary
Railway Club of Pittsburgh,
Pittsburgh, Pa.

Dear Sir—Your invitation to visit Pittsburgh on Friday evening next, the 24th instant, is at hand, and regret exceedingly I shall be unable to attend.

Wishing your organization and its officers continued prosperity and success, believe me,

Yours truly,

D. M. Brady.

NEW YORK RAILROAD CLUB.

New York, October 18, 1902.

Mr. J. D. Conway, Secretary
Railway Club of Pittsburg,
Care P. & L. E. R. R., Pittsburgh, Pa.

My Dear Sir—At the meeting of this club, held on the 16th instant, it was decided to change the night of our regular meeetings to the third Friday of each month, except June, July and August; we have hitherto used the third Thursday. Our next meeting will therefore be held on Friday evening, November 21st, 1902.

At the same time it was decided to meet hereafter at Carnegie Hall, No. 154 West Fifty-seventh street, New York City, where we shall have ample and adequate facilities.

We desire to promptly acquaint the members of the Railway Club of Pittsburgh of these changes and extend a cordial invitation to such of them as may be visiting this city on one of our meeting nights to meet with us; if such a member will but kindly introduce himself to the Secretary or a member of our Reception Committee we shall take pleasure in seeing he is made to feel as much at home as may be possible. Will you please advise your members as above?

Very truly,
W. B. Yereance, Secretary.

NEW ENGLAND RAILROAD CLUB.

Boston, Mass., Oct. 20, 1902.

J. D. Conway, Secretary
Railway Club of Pittsburgh,
Pittsburgh, Pa.

Dear Sir—I have your kind invitation of October 11th to the smoker to be held on Friday evening next at Hotel Henry. I shall, of course, be unable to be present, but regret that I cannot do so. I wish for you and the members of your Club on this occasion an enjoyable time, which you will no doubt have.

Yours truly,
Edw. L. Janes, Secretary.

President: By the by-laws of this Club, notices were sent out to all the members of the Club asking them to express their preference for officers for the coming year. The Secretary has received replies from something over 130 members, and he will now read the summary of their expressed preference.

Secretary: The vote for the various officers to serve for the year 1902-03 is as follows, the highest vote for each office only being read:

For President, J. H. McConnell received 110 votes.

For Vice President, L. H. Turner received 95 votes.

For Secretary, J. D. Conway received 130 votes.

For Executive Committee, D. F. Crawford received 100 votes; J. E. Simons received 101 votes; F. T. Hyndman received 106 votes.

For Treasurer, J. D. McIlwain received 114 votes.

On motion of Mr. H. W. Watts the election of these officers is made unanimous.

President: The next thing in order is the report of the Secretary and the financial report.

Secretary Conway then read his annual report, including the Treasurer's report, as follows:

This being our first annual meeting, marking the first year of the Club's existence, makes it of more than passing interest, and a brief review may not be considered out of place at this time.

The organization of this Club was effected at a meeting held at the Hotel Lincoln in this city October 2d, 1901, there being an even 50 names enrolled as members; this list has been increased by a steady growth during the year, as shown by the present membership in summary following. The papers presented and discussed at our meetings have been interesting and instructive, our financial condition healthy, considering the short time in which we have had to interest our good friends, the advertisers, and it is hoped the liberal assistance they have given may be returned many fold.

We are indebted for favors shown us by the Hotels Lincoln and Henry in furnishing comfortable quarters for our meetings with other kind attentions.

The officers of the Club have worked earnestly and faithfully during the year, by their presence at the meetings and efforts in every way to make the Club a success, and the members have given substantial aid by their co-operation in many ways. The attendance at our meetings has been generous considering the abnormal business conditions existing. One page of our proceedings has already been claimed to record the loss of a member by death, Mr. Aaron French.

Following is a summary of the financial condition, etc., of the Club up to and including this meeting:

MEMBERSHIP.

Total number received	313
Suspended	0
Removed by death	1
Present membership	312

FINANCIAL.

Receipts—		
From dues	$ 540 00	
From advertisements	1,141 45	
From sale of proceedings	9 25	
From subscriptions	1 00	
From interest on deposits	2 62	$1,694 32
Disbursements—		
Printing proceedings, advance sheets and notices	$ 824 74	
Postage	99 94	
Reporting proceedings	115 00	
Secretary's trip to Saratoga	46 74	
Stationery and incidental supplies	59 75	1,146 17
Balance in hands of Treasurer		$ 548 15

The assets and liabilities may be considered about as follows:

Assets—		
Balance in hands of Treasurer	$548 15	
Due from new members	86 00	
Due from advertisements	200 00	$834 15

Liabilities—

Salary of Secretary year 1901-1902	$500 00	
Printing	113 87	
Reporting proceedings	15 00—	628 87
		$205 28

Respectfully submitted,

J. D. CONWAY,
Secretary.

Approved:

D. F. CRAWFORD,
J. E. SIMONS,
F. T. HYNDMAN,
Executive Committee.

TREASURER'S REPORT FOR THE YEAR ENDING OCTOBER, 1902.

Your Treasurer begs leave to present his first annual report for the year ending October, 1902:

Received from Secretary	$1,691 70
Interest on deposits	2 62
Total	$1,694 32
Paid out on Secretary's checks	1,146 17
Balance on hand	$ 548 15

Respectfully submitted,

J. D. M'ILWAIN,
Treasurer.

Approved:

D. F. CRAWFORD,
J. E. SIMONS,
F. T. HYNDMAN,
Executive Committee.

Music by the Glee Club.

Col. J. M. Schoonmaker was then introduced by the President and addressed the Club in a very interesting talk on "Pittsburgh, Past and Present."

President: Gentlemen, we have with us this evening Mr. George A. Post, of New York City, who has kindly consented to talk to us.

Mr. Post:

Mr. President—To account for my presence here to-night I will have recourse to a story that is somewhat ancient, but as it portrays my idea, I will tell it. The story is told of a rustic couple who had become very much enamored of each other, and they had become what is called in the country "steady company," and from that they had advanced to what is called "settin' up nights." So it happened that upon stated occasions Jeremiah would go to the home of his beloved Jerusha and they would sit at a respectful distance from each other—as long as the old folks stayed up. After a while when pa and ma got tired and went off upstairs to bed, Jeremiah and Jerusha began to sort of nudge up a little closer to each other. And they would keep on nudging and nudging until they could not get any "nudger." And, finally, Jerusha landed right square in the lap of Jeremiah, whereupon Jeremiah looked up into her eyes, lit up with love, and he said, "Jerusha, do you love me?" Jerusha looked down somewhat reproachfully into Jeremiah's eyes and said, "Jerry, if I didn't love you, I wouldn't be here." (Laughter.) So, Mr. President, having received your urgent invitation to come here to-night, I simply say that if I didn't love you I wouldn't be here. (Applause.)

Gentlemen: It is certainly a very great pleasure for me to be present upon this, the occasion of the first annual meeting of the Railway Club of Pittsburgh. These Railway Clubs, which have now become so numerous, are doing a splendid work in bringing into closer social contact the railway men and their friends, the railway supply men, than their ordinary environment would call for. And certain it is, that the discussions that are carried on in these clubs make for greater efficiency of the members in their official stations.

It would certainly be presumptuous for me in such a presence as this to attempt to discuss for a moment any technical subject appertaining to the construction and maintenance of cars, locomotives or roadway, or to talk of traffic or ac-

counting, or any cognate subjects in the realm of railway economics, because, if I were to so attempt, I should certainly fail to add anything to your store of knowledge, and I am mightily afraid that I should subtract from your estimate of my general intelligence.

I have listened oftentimes with wonder, and sometimes with awe, to the learned disquisitions from the members of these railway clubs, as they have told us how the plug, plane, forge, level, caliper and otherwise cavort mechanically in their diurnal operations, until I have become saturated with a belief in and admiration of their greatness. And this idea of their greatness has not been altered when, subsequently, I came in contact with some of them in my capacity as a railway supply man. Perhaps it was their ability to make me feel small that confirmed my original idea of their majestic proportions. I have in my career left the presence of some railway officials with a feeling that if I "looked like thirty cents" I was guilty of fraudulent pretenses, because to have capitalized my wounded and crushed feelings at thirty cents would have been a gross and wicked stock-watering process. (Laughter and applause.)

Perhaps this thought suggests a topic to which I may apply myself during the few minutes that are allotted to me to-night.

Now, from the railway supply man's standpoint, there are just two kinds of railway officials. The first are those who are kind and considerate to the railway supply men, who, as anxious and humble suitors for their favor, wear out the doormats and carpets leading into their august presence. The second are those who are not so kind and considerate.

Now, we supply men know how our hearts go out to the first of the kinds enumerated. We treat them kindly, we treat them nicely, we treat them to the best we have, we treat them as often as we can, and their slightest wish is our supremest desire. Even a vague intimation that they would like to see us fills us with abundant joy. (Laughter.)

The second class of railway officials, we also treat well. It is our business to treat them well. (Laughter.) We cannot

afford to do anything else. But we do pray for them nights! We do hope for their reformation, but most of all do we hope for their orders. And so with simulated pleasure and satisfaction we greet them—whenever we can get at them—and spin out our story of the beauties and excellencies of the wares we have to dispose of, until icicles begin to accumulate on the ends of our noses, caused by the refrigerating process to which we are subjected. (Laughter and applause.)

Now, in the Providence of God, it sometimes happens that a railway official becomes an "ex-railway official," and then is presented to the railway supply man the grave problem of how to treat a man who no longer has favors to bestow. This is a very solemn thought.

Years ago when I was a lad at school, and with corrugated brow I tried to solve the problems in algebra, "X" always represented the unknown quantity. Later in life, and especially during that beautiful, halcyon and vociferous period during which it has been my blessed privilege to be allied to the supply profession, I have noticed with regret that there is a tendency upon the part of some of the members of my craft to treat the railway man out of a job as the algebraic "X," that is to say, as an unknown quantity. (Laughter.) But ever in the heart of the well-regulated, high and clean-minded railway supply man, there is an abiding sense of appreciation and gratitude for courtesies received. When I say courtesies received, I do not necessarily mean that the official has given us all the orders we wanted, for I never saw a railway supply man yet who could be fixed that way. But it is the treatment accorded, the courteous recognition of the fact that the man who has something to sell also has feelings that can be wounded. Now it naturally follows that when one has been upon the throne, but has lost his superior and glittering post of power and dignity, leaving, however, behind him a record of courtesy and consideration, the railway supply man does not forget him (or he should not do so), but feels that it is up to him to show a spirit of reciprocation. He does not pass him by with the glacial eye, nor does he extend to him

the frozen palm. This is human nature; it is just 18-karat gratitude, and it is as it should be.

But when the particular man who has attained the prefix "ex" before his whilom title, is one who, as he reclined upon the damask and rep in the luxuriously appointed quarters of the modern railroad office, was crusty, brusque and ill-mannered to the man with the carpet bag, and who amused himself by pitchforking the traveling vender of supplies—what is the natural greeting that awaits him as he stands under the cloud of embarrassment as to the future, and suffers the pains and embarrassments of a lack of employment?

It is for this man that I stand here to-night as advocate, and with all the earnestness of my yearning soul I entreat for this man a continuance of the beningant smile, the offering of the fragrant Havana, the invitation to "have something," or to partake of other hospitalities which are suggested by genial intercourse. He needs them. It is in this very necessity for good cheer and good fellowship that lies the hope of his ultimate redemption. Who knows but that this same man may emerge from the Slough of Despond, come out from under the Cloud of Embarrassment. and by our help, step by step, he may climb to the heights of glory whereon we stand, be equipped with a carpet bag and model case, and with flushed cheek—or offices of railway men who yet hold their jobs to show them the "best ever?" (Great laughter and applause.) We shall certainly have taught this man some of the ethics of trade, and we shall have blazed the path wherein he may earn an honest and comfortable livelihood for himself and the children.

And then, again, and to use a slang phrase of ancient vintage, "you can't most always sometimes generally tell what you least expect the most." For such things have happened, and it is entirely in accord with the Divine plan of the resurrection, that this very man may get another railway job, burnish up his official armor, go and order a new suit of glad rags, readjust the halo on his head, and then—we shall be very very glad that we were good to him. (Applause.)

I shall close this little rambling talk by relating the story

of a Teutonic supply man who was telling the difference between a railway supply man and a dog.

He was in Chicago, in a hotel at night, and he had evidently during the day been in a bad and frigid atmosphere. One of the brethern of the craft approached him and said:—

"Well, Jake, how are you? Are you happy?"

"Happy!" said Jake, with despairing look, "ven you shpeaks aboud a railvay sooply man peing happy, dond you know dot a railvay sooply man ain'd in id mit a dog?"

"How's that, Jake?"

'Id's shust dis vay," said Jake. "You take a dog. Dot dog dond do nodding. He dond vork, bud efery morning ven he cooms arount, dere is von plade of wittles oud for him at the back of der house, und he feeds full. He dond deserve id. He haf done nodding for id. Bud dere is der whole meal. Und ven he eats himself full, he chase der chickens und der cats and kavoorts arount until noon. Ven der noon times haf coom, dere iss more grub for der dog dot he ain'd earned. So he stuffs his skin again, und den goes off and lays down und shleeps halluf of der afternoon. Ven supper time cooms der goot-for-nodding dog gets anudder schquvare meal mitoud a cent, und ven nighd comes h- crawls in his kennel vere id iss coomfty, und lays dere und schnoozes all nighd to get ready for his breakfust in der morning. Der dog has nodding to do bud shust haf a goot time until he iss an old dog und iss sick und he dies, and dot iss der end of der dog.

But how iss id mit der railvay sooply man? He must hussle from der morning till der nighd time. He has to rush oud to catch his train mitoud time to schvallow his breakfust, und he get gullop of vind on his stomach. Ven he gets down to his office dere iss a stack of mail vaiting for him, und he goes troo id und reads dat von feller tells him dat his goots ain'd vort nodding, anudder vants to know vy he don'd sent him de goots he haf promised, anudder tells him dat a coostumer haf gone broke und he lose de money he owe him, und anudder say dat a railroad vat owed him a bunch of money haf gone into der hands of der receiver, und he don'd get his money for a long long time, if he get it den. Den he goes oud on der road und

tries to see dis man und dat man, und he don'd make oud. Und he haf to write reports to der boss efery nighd und told him about tings, und den de boss he write back und tell him dot he dond'd vant so much conversationing, but he vant orders. So der poor sooply man he traffle nighds und he traffle days, und he gets nerfous prosperity, diespepsy, insomania, und all dose tings, until, finally, like der dog, he lies down und dies too.

Bud iss dot der end of der railvay sooply man? Not by a d——— sighd. He haf got to go to h———yet. I told you dot der railvay sooply man ain'd in id mit a dog. (Great applause.)

Secretary Conway in few words introduced the incoming, and outgoing, president, Mr. J. H. McConnell, who responded briefly, after which the remainder of the evening was given up to music and social intercourse.

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Vice Pres. Am. Nut & Bolt Fastner Co.,
Frick Building,
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Miller, Wilson,
937 Lincoln avenue,
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Miller, John F.,
Sec'y Westinghouse Air Brake Co.,
Pittsburg, Pa.

Miller, Marion M.,
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325 Water street,
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Miller, Ira H.,
Spl. Rep. Magnolia Metal Co.,
German Nat. Bank Bldg.,
Pittsburg, Pa.

Miller, Orlando,
Pur. Agt. Westinghouse Air Brake Co.,
Wilmerding, Pa.

Milligan, J. D.,
Chief Surgeon,
P. & L. E. R. R. Co.,
Bank for Savings Bldg.,
Pittsburg, Pa.

Miner, W. H.,
Ry. Supplies,
669 Rookery Bldg.,
Chicago, Ill.

Mooney, E. P.,
Rep. Ingersoll-Sargeant Drill Co.,
503 W. Delaware ave.,
Buffalo, N. Y.

Morris, W. B.,
Chief Clerk to Gen'l Pass. Agt.,
P. & L. E. Gen'l Office,
Pittsburg, Pa.

McCarty, R. E.,
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48th st. & A. V. Ry.,
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McCune, Frank,
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2nd ave., near Bates st.,
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McFeatters, F. R.,
Supt. Union R. R. Co.,
Port Perry, Pa.

McCool, Peter,
Mngr Std. Steel Car Co.,
Butler, Pa.

McConnell, J. H.,
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American Locomotive Co.,
Pittsburg, Pa.

McConway, Wm., Jr.,
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McIlwain, J. D.,
Pres. J. D. McIlwain & Co.,
208 Third avenue,
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McIlwain, Harry,
Rep. J. D. McIlwain & Co.,
208 Third avenue,
Pittsburg, Pa.

McKee, S. Frank,
Pur. Agt. Penna. Car Wheel Co.,
Allegheny, Pa.

McKenna, E. P.,
Gen'l F. & Pass. Agt.,
Cumberland & Penna. R. R. Co.,
Cumberland, Md.

McKim, J. B.,
Supt. Penna. Lines W. of Pgh.,
Ft. Wayne, Ind.

McLean, Geo. A.,
Iron & Steel Mfr.,
Lewis Building,
Pittsburg, Pa.

McLellan, J.,
M. M., West Penn Div.,
P. R. R. Co.,
Allegheny, Pa.

McMahon, W. C.,
Mangr. of Sales,
Mich. Malleable Iron Co.,
Detroit, Mich.

McNary, Jas. E.,
M. Engr. Tranter-Davis Mfg Co.,
105 Water street,
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McNulty, F. M.,
M. M., Monon. Con. R. R. Co.,
Second avenue,
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McTaggart, Jas. R.,
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Public Safety Building,
Pittsburg, Pa.

McVicar, G. E.,
Expert, Galena Signal Oil Co.,
Franklin, Pa.

Nanna, F. J.,
Asst. Engr., P. & L. E. R. R. Co.,
Roscoe, Pa.

Neale, Jas.,
Sec'y, Brown & Co.,
Tenth street,
Pittsburg, Pa.

Noble, D. C.,
Pres. Pgh. Spring & Steel Co.,
German Nat'l Bank Bldg.,
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Norton, A. O.,
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Boston, Mass.

Obey, G. B.,
Supt. P. & L. E. R. R. Co.,
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Pittsburg, Pa.

O'Toole, J. L.,
Car Acct. Pgh. Coal Co.,
Pittsburg, Pa.

Owston, C. W., Jr.,
Pres. Eclipse Co.,
Times Building,
Pittsburg, Pa.

Paxton, J. L.,
Gen'l Supt., Union Stock Yards & R. R. Co.,
S. Omaha, Neb.

Pelletier, Louis,
Res. Mangr. Railway Age,
Frick Building,
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Perine, D. M.,
M. M., Penna. R. R. Co.,
28th st., South Side,
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Pfeil, John,
Gen'l Mangr. Am. Spiral Spring Co.,
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Pomeroy, L. R.,
Spe. Rep. Ry. Dept., Gen'l Electric Co.,
44 Broad street,
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Porter, Chas.,
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Yough. & Ohio Coal Co.,
Peoples Savings Bank,
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Porter, H. K.,
Pres. H. K. Porter & Co.,
541 Wood street,
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Porter, H. T.,
Chief Engr. B. & L. E. R. R. Co.,
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Postlethwaite, C. E.,
Sales Agt. Pressed Steel Car Co.,
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Prendergast, J. F.,
M. M., B. & O. R. R. Co.,
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Prosser, C. S.,
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Proven, John,
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Rhodes, G. P.,
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Mangr. Sherwin-William Co.,
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Richardson, W. P.,
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Ritchie, Jas. M.,
Pur. Agt. B. & L. E. R. R. Co.,
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Riley, J. W.,
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Safford, J. B.,
Supt. P. C. & Y. Ry. Co.,
Gen'l Office P. & L. E. R. R. Co.,
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Sage, Henry J.,
E. E., Crocker-Wheeler Co.,
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Sargent, F. W.,
Chief Engr. Tests, Am. Brake Shoe & Fdy. Co.,
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M. P. Inspr., B. & O. R. R. Co.,
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Spg. Co.,
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Seeley, J. S.,
Mech. Expert, Galena Oil Co.,
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Shaler, Fred J.,
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Shannon, Chas.,
Rep. Lowe Bros.,
Dayton, O.

Sherman, C. W.,
Gen'l Mangr. Penna. Mall. Co.,
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Shields, H. S.,
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Sickle, Welling G.,
V. P. United & Globe Rubber
Mfg. Co.,
Trenton, N. J.

Simmons, W. M.,
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Smith, Sam'l L.,
Mangr. Nat'l Mall. Cas ings Co.,
Cleveland, O.

Smith, Harley G.,
Rep. Cleveland Twist Drill Co.,
Cleveland, O.

Snyder, G. W.,
Asst. Engr. Monon. Div. P. R. R.,
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Soles, G. H.,
M. C., P. & L. E. R. R. Co.,
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Squire, Willis C.,
M. E., Frisco System,
Springfield, Mo.

Stark, F. H.,
Supt. R. S., Pgh. Coal Co.,
Co aopolis, Pa.

Stark, B. F.,
Pres. Stark Vent. Window Co.,
Homestead, Pa.

Steinman, E. D.,
City Ticket Agt., B. & O. R. R. Co.,
Cor. 5th ave. & Wood st.,
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Stowell, Myron R.,
Rep. Patterson-Sargent Co.,
Cleveland, O.

Stovel, R. W.,
E. E., Westinghouse, Church, Kerr & Co.,
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New York, N. Y.

Strattan, G. W.,
P. R. R. Co.,
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Stucki, A.,
M. E., Pressed Steel Car Co.,
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Suydam, R. S.,
Pres. M. B. Suydam Co.,
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Rep. Keasbey & Mattison Co.,
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Penna. R. R. Co.,
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Tucker, John L.,
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Turner, J. J.,
3rd Vice Pres. Penna R. R. Co.,
Pittsburg, Pa.

Turner, John S.,
Rep. Standard Coupler Co.,
160 Broadway,
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Turner, Alex.,
Rep. Galena Signal Oil Co.,
W. U. Building,
Chicago, Ill.

Vogels, E. P.,
Sec. & Treas. Protectus Co.,
North American Building,
Philadelphia, Pa.

Walker, C. E.,
Mangr. Ry. Dept.,
Chicago Pneumatic Tool Co.,
Fisher Building,
Chicago, Ill.

Walsh, J. J.,
Gen'l Fore. P. C. C. & St. L. R. R. Co.,
Dennison, O.

Walter, Edward P.,
C. C. Keystone Car Wheel Co.,
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Ward, Frank B.,
Mangr. Niles Tool Works Co.,
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Warne, J. C.,
Supt. Machy. Penna. Casting & Mach. Co.,
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Warner, E. O.,
Rep. Latrobe Steel & Coupler Co.,
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Watts, H. W.,
M. C. B. Monon. Con. R. R. Co.,
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Treas. W. W. Lawrence & Co.,
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Gen. Mangr. Pgh. Blue Print Co.,
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Pittsburg, Pa.

Whitney, Louis B.,
Treas. Keystone Car Wheel Co.,
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Whitton, R. L.,
Rep. Berry Bros., Ltd.,
Detroit, Mich.

Wilson, Hugh M.,
Pres. Railway Age,
Monadnock Block,
Chicago, Ill.

Wilson, J. T.,
Pres. Am. Bal. Slide Valve Co.,
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Wood, Wm. A.,
Rep. Manufacturers & Producers Supply Co.,
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Yohe, J. B.,
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